A MULTIPLE ATTRIBUTE DECISIONMAKING METHOD
FOR MAKING A TRAINING EFFECTIVENESS COMPARISON
OF EMBEDDED TRAINING TO OTHER TRAINING ALTERNATIVES
FOR DEVELOPMENTAL SYSTEMS

by

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B.S., United States Military Academy, 1975

Submitted to the Department of Engineering and the Faculty of the Graduate School of the University of Kansas in partial fulfillment of the requirements for the degree of Master of Engineering.

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September 1989
Date Thesis Accepted

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION
Unclassified/Unlimited

1b. RESTRICTIVE MARKINGS

2a. SECURITY CLASSIFICATION AUTHORITY

2b. DECLASSIFICATION / DOWNGRADING SCHEDULE

3. DISTRIBUTION / AVAILABILITY OF REPORT

4. PERFORMING ORGANIZATION REPORT NUMBER(S)

5. MONITORING ORGANIZATION REPORT NUMBER(S)

6a. NAME OF PERFORMING ORGANIZATION
University of Kansas

6b. OFFICE SYMBOL *(If applicable)*

7a. NAME OF MONITORING ORGANIZATION

6c. ADDRESS *(City, State, and ZIP Code)*
Lawrence, Kansas 66045

7b. ADDRESS *(City, State, and ZIP Code)*

8a. NAME OF FUNDING / SPONSORING ORGANIZATION

8b. OFFICE SYMBOL *(If applicable)*

9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER

8c. ADDRESS *(City, State, and ZIP Code)*

10. SOURCE OF FUNDING NUMBERS

PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO.

11. TITLE *(Include Security Classification)*
A Multiple Attribute Decisionmaking Method for Making a Training Effectiveness Comparison of Embedded Training to Other Training Alternatives for Developmental Systems.

12. PERSONAL AUTHOR(S)
Hardy, H. Critz

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT *(Year, Month, Day)*	15. PAGE COUNT
Master's Thesis	FROM ______ TO ______	September 1989	295

16. SUPPLEMENTARY NOTATION

17. COSATI CODES

FIELD	GROUP	SUB-GROUP
05	06	

18. SUBJECT TERMS *(Continue on reverse if necessary and identify by block number)*
Training, Comparison, Embedded training

19. ABSTRACT *(Continue on reverse if necessary and identify by block number)*

Recent technological advancements now permit serious consideration of embedded training as a training alternative. To embed a training subsystem, decisions on the composition of the training package must be made early in the developmental cycle. Current methods of predicting training effectiveness do not permit an effectiveness based comparison of training alternatives early in a new system's development. This project presents a training effectiveness comparison method to overcome this problem.

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS

21. ABSTRACT SECURITY CLASSIFICATION
Unclassified/Unlimited

22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE *(Include Area Code)*	22c. OFFICE SYMBOL
Lorraine A. Mitchell	(502)624-6231	ATSB-TDL

DD Form 1473, JUN 86 *Previous editions are obsolete.* SECURITY CLASSIFICATION OF THIS PAGE

Unclassified/Unlimited

ABSTRACT

Recent technological advancements now permit serious consideration of embedded training as a training alternative. To embed a training subsystem, decisions on the composition of the training package must be made early in the developmental cycle. Current methods of predicting training effectiveness do not permit an effectiveness based comparison of training alternatives early in a new system's development. This project presents a training effectiveness comparison method to overcome this problem.

The training effectiveness comparison method is a seven step process which identifies the tasks for analysis, screens tasks for embedded training candidates using the U.S. Army Research Institute's screening process, structures the problem using Saaty's Analytical Hierarchy Process, obtains individual subject matter expert training alternative rankings using the Technique of Order Preference by Similarity to the Ideal Solution, and aggregates those rankings using the Borda technique. The project develops the method, demonstrates the method using a sample system (the next generation tank), and provides conclusions and recommendations. The method was determined to be appropriate for preliminary training effectiveness analyses of the type conducted by the U.S. Army Training and Doctrine Command.

ACKNOWLEDGMENTS

In a project such as this there are always several people who were instrumental in its completion. This small acknowledgment does not do enough to recognize the true value of their contribution. First, to my committee, a sincere thank you. Dr. Fortin's patient leadership and thought provoking guidance was key in making possible what I hope to be a useful product. Dr. Fallesen and Dr. Lowden both provided critical training input which kept my efforts focused on attaining a practical rather than abstract method. All three willingly took the time from what I know to be busy schedules to keep this effort on track. I am indeed grateful. Second, I must extend a special thanks to the folks who spent many hours completing the lengthy questionnaire. To Mary Blome, Jim Hamill, Mike Kelley, Bill Parker, Gary Priest, and Kathy Quinkert I am in your debt. Finally, I acknowledge my wife Michelle. Her contribution was to give me the quiet time necessary to think through the problems encountered developing the method.

CONTENTS

CHAPTER I. INTRODUCTION: THE PROBLEM.

Technological progress in training now offers exciting opportunities to improve the U.S. Army's ability to effectively employ modern, lethal weapons systems in combat. Advances in computational capacity and storage, interactive dynamic high fidelity imagery, networking, software, courseware, full content voice recognition and generation, and artificial intelligence[1] will dramatically improve the training subsystems in use today (e.g. computer based instruction, flight simulators). Moreover, our ability to apply this new training technology now is no longer limited to conventional training alternatives. The advanced technology presently being designed into new combat systems - solid state fire control computers, very high speed integrated circuitry, and electronic display screens - permits serious discussion of a new training subsystem alternative: embedded training.

Embedded training poses new challenges to those who develop combat systems and their training subsystems. But before I elaborate on these challenges let me define embedded training and discuss its general advantages and disadvantages. The U.S. Army defines embedded training as: 'training that is provided by capabilities designed to be built into or added onto operational systems to enhance

and maintain the skill proficiency necessary to operate and maintain that equipment end item."[2] Embedded training is a package designed to train the operator by using the actual equipment rather than, for example, externally based classroom instruction or aircraft flight simulators. Embedded training has many applications. Bank tellers can use intelligent software within the computer terminal used to process customer transactions to learn how to process those transactions. Driver's education of the 21st century may well use an embedded simulation in an actual automobile to provide a full range of driving situations a student must master or a licensed driver must sustain.

Training subsystems which are embedded may take one of several forms. They may be appended, adjunct, or fully integrated with the operational equipment. Appended subsystems can be quickly attached. This permits use of the operational equipment to conduct the training exercise, but the training exercise software or other hardware required to conduct the exercise is not attached permanently or included within the operational equipment. In the driver's education example, the appended components of the training subsystem might be the computer and software package which provide the situations and the front windshield attachment which presents the visual

simulation to the driver. The mounting hardware for the windshield attachment and the electrical and data connections to the automobile would be installed permanently and interfaced with the controls of the automobile. Adjunct training subsystems are mounted permanently to the operational system but are separate from the operational components. The computer which provides the situation package in the automobile example might be mounted permanently somewhere within the automobile and already attached to the electro-mechanical interfaces required to process information between the training simulation (situations) and the driver. However, the computer would remain separate - its sole function would be to act as part of the training subsystem. A training capability may also be fully integrated within the operational equipment. In the case of our future automobile, the onboard computer (which might control interior temperature, fuel efficiency and fuel dispensing, brake operation, and position navigation) would also contain the training software necessary to operate the situation simulation. This fully integrated embedded training subsytem would use many of the same electronic and data circuits required for normal automobile operation.

There is another point to be made about embedded

training. Embedded training is more than the simple presentation of information. It must provide performance assessment to determine the proficiency level of the user, feedback to the user to improve performance or reinforce correct performance, and record keeping to manage the training proficiency progression of the user.[3] This three part requirement may be provided by the training subsystem itself or may be provided by an "off line" instructor or facilitator designated to observe the training.

The use of embedded training can improve dramatically the training readiness of soldiers, crews, and units. Embedded training has several distinct advantages. First, training embedded in the combat system provides a training subsystem which is available concurrently with the fielding of the new system. Training devices or simulators for reasons of cost or available training technology frequently have been fielded after the new combat system has arrived at the using unit. Because embedded training is designed into the combat system at the earliest engineering stages, this training subsystem can be tested and produced at the same time as the combat system. Second, embedded training will permit instruction on how to operate the tank without the large instructor cadre required today. This training will provide a

training program for soldiers who must use different tanks from either prepositioned stocks (POMCUS) or war reserve during periods of conflict when large, fully trained instructor groups are not available. Third, embedded training provides a readily available training package for sustainment training in units. Fourth, embedded training can provide a training management (record keeping) capability that will relieve this type of administrative burden from unit trainers. This capability may ultimately provide more objectivity in the readiness reporting system. Fifth, embedded training can help standardize training across the force, regardless of the geographic location or major Army command (MACOM) of the soldier. It does this because the lesson content and performance standards originate from one source and are part of the combat system.[4] Moreover, it may be easier to incorporate performance assessment into an integrated embedded training system.

Embedded training is not without its disadvantages. First, the costs can be high. The costs include both component acquisition and lesson development costs. These lesson development costs continue as doctrine evolves over the life of the combat system. These costs are often included in the total procurement cost of the combat system. This means a developer with a fixed budget

may have to accept a less effective training subsystem because the item cost now makes achieving the desired quantity impossible. Second, embedded training requires more frequent use of the combat system. This use makes it more difficult to achieve the required level of reliability, availability, and maintainability of the system. Additional ruggedness must be designed into the parts of the system used for training to ensure the system can maintain its required operational rate. For those parts of the training subsystem that are embedded fully with the operational hardware, designers must ensure that failure of the training subsystem does not affect performance of the operational subsystem.[5] Finally, since embedded training requires advanced technology, there are technical risks associated with choosing a technology that will be available in time for production. Failure to advance a key technology may change the embedded training approach dramatically . Of course, this is a risk to the operational system as well, but in the past, training developers frequently relied on proven technology to develop training devices for existing systems.[6]

The U.S. Army has recognized the potential training opportunities embedded training has to offer. For this reason, Army policy requires that:

"An embedded training capability be thoroughly evaluated and considered as the preferred alternative among other approaches to the incorporation of training subsystems in the development and follow on Product Improvement Programs of all Army material systems."7

This means that embedded training is now the training alternative of choice. Moreover, the reasons that embedded training is not selected (the Army does recognize that embedded training is not appropriate for all tasks) for a particular portion of the training package will be discussed during each major milestone decision review of the new operational system.

The formal process for the study of training alternatives is the U.S. Army Training and Doctrine Command Training Effectiveness Analysis (TEA) system. Developmental training effectiveness analyses (DTEA), one of two major subcategories of the TEA system, are the analyses which look at the application of embedded training to the training subsystem. The DTEA is comprised of the preliminary training effectiveness analysis (PTEA), the cost and training effectiveness analysis (CTEA), and the training development study (TDS). The PTEA contributes to the development of training strategies for a new hardware system. It generally assesses: who is to be trained; what skills are to be trained; and how, when,

and where training will be accomplished. The CTEA, conducted after the PTEA, investigates the comparative effectiveness and cost of training alternatives developed for a new hardware system. It includes an analysis of the levels of proficiency attained by the different training alternatives, an analysis of the cost associated with these alternatives, and a cost effectiveness tradeoff analysis.[8]

The effectiveness study of embedded training is a new challenge to training analysts because decisions about the incorporation of this alternative must occur early in the development cycle of a new system. Other training alternatives can be designed effectively only after much is known about the final design of the new system. Embedded training, in order actually to be embedded, must be incorporated into the system design early to avoid a significant redesign effort later in the developmental cycle. These necessary early decisions are in fact an advantage of embedded training. They force the operational designer of the system to consider the effect the design will have on the requirement to train the operator how to use it. This is so because the next step will be to consider what type of training package will be required to train the system just designed.

An investigation into the effectiveness of a training

alternative is not so difficult later in the design cycle when an operational system equipped with an embedded training package is available for testing. However, it is very difficult to evaluate a proposed embedded training package in the early stages (PTEA) of system development. It is difficult because little empirical data exist from which to analyze and subsequently decide upon a training package which then must go to the full scale engineering stage.

There are several methods in use today which are designed to predict the effectiveness of either training programs or training devices. The principal methods are discussed in Chapter II. These methods are not suited for the required early investigation of embedded training for two reasons. First, they either do not include embedded training as a training medium, method, or alternative. Second, they often require the very data which we have just seen is not normally available early in the developmental cycle.

The problem, therefore is that current training effectiveness prediction methods do not permit a comparison of embedded training to other training alternatives early in the developmental cycle of a system. The purpose of this project has been to develop such a method. This method will be applied during the

preliminary training effectiveness analysis stage. It is here where training strategies are developed and where candidates (by function or task) for embedded training are identified.

Research into embedded training evaluation began several years ago. A method has been developed to identify candidate tasks for embedded training. The U.S. Army Research Institute generated a screening process to select embedded training candidates starting with a list of tasks which must be trained to operate the new system. What remains to be established is a method for determining the training effectiveness of these candidates as compared to other training subsystem alternatives.

This project is organized to establish such a method in three parts. First, Chapters I through IV develop the method by: identifying the problem, providing a summary of principal methods available today, discussing the ARI screening process[9], and detailing the method's development. Second, Chapters V through VII demonstrate the model using a sample system. This is accomplished by screening the gunner's position tasks of the Future Armored Combat System - the next generation tank, setting up the problem, and determining final rankings. Third, Chapters VIII and IX provide conclusions and recommendations. Finally, the appendices provide input

data, background information, and the organization of the project.

The object of this effort is to go beyond the screening process in an effort to provide the decisionmaker critical training effectiveness information. This additional information increases the chance of selecting the best training alternative (in terms of effectiveness) at the critical point early in the development cycle. This training alternative ranking method can be used by all the proponent schools of the U.S. Army Training and Doctrine Command as they perform preliminary training effectiveness analyses on their developing combat systems.

CHAPTER II. CURRENT METHODS OF PREDICTING TRAINING EFFECTIVENESS.

There are several methods which have been developed to estimate the effectiveness of a training program. The purpose for this section is twofold. First, the criteria for the training alternative comparison method developed in Section IV are obtained from the substantial research conducted to establish the present methods. Second, these models are shown to demonstrate that they do not resolve the problem presented in Chapter I. Therefore, a new method is required. The four key models are the Training Efficiency Estimation Model (TEEM), Analogous Task Method, TRAINVICE IV, and Training Consonance Analysis. This section provides a summary of how these models work.

The Training Efficiency Estimation Model was developed by Jorgensen and Hoffer in 1978.[10] This model generates an estimated training program for a developing system through task analysis, selection of training media and methods, and identification of information content and structure. For each alternative training program established an efficiency ratio is calculated. This ratio represents the training efficiency value of the program when subjected to real world constraints divided by the training efficiency value of the same program with no constraints. This efficiency ratio can then be compared

to alternative training programs to predict the most effective program for a developing system.

The TEEM analysis begins with a comparison of a task required by the developing system (e.g. engage targets with the main gun from the gunner's station) to three general categories of media related variables - stimulus, response, and feedback. Examples of these variables are: stimuli - medium of stimuli presentation, visual form, visual movement; response - response mode of implementation, intensity of response, required response rate; and feedback - medium of feedback presentation, source of feedback, type of feedback. A fourth set of variables, functional context variables, are also compared to the task. These four categories of variables (39 stimulus, 16 response, 17 feedback, and 13 functional context) are evaluated to determine if they apply to the task. A 1 is awarded to variables that apply to the task. A 0 is awarded to variables that do not apply.

The next step in the TEEM analysis is to determine what training medium best fits the particular task under consideration. First, each group of the three media related variables (stimulus, response, and feedback) are compared against 38 items of training equipment and materials (e.g. case study folders, flash cards, programmed texts, computer, etc.). Again, 1 is awarded

when the training equipment or material matches the stimulus, response, or feedback variable. Second, using only those media variables initially identified (first step) as relevant to the task under consideration, a total score for each of the different types of training materials is computed. The training material with the highest score is selected (in each of the three media related variable categories). Ties are broken by selecting the least expensive training material.

The third step is to select the method of training. This is accomplished by comparing 23 methods of training (e.g. lecture, conference, demonstration, role playing) with the 13 functional context variables (e.g. role of element, function performed in the role, physical context, psychological impact). Again 1 is awarded when the method matches a functional context variable for the task under consideration. Then, using only those functional context variables initially identified (first step) as appropriate to the task under consideration, a total score for each of the different training methods is selected. The method with the highest score is selected.

The final step in the TEEM analysis is to determine the optimal mix of media for all the tasks that support the developing system or to compare alternative mixes of media (selected for reasons of cost or availability).

This comparison measure is an efficiency ratio - the result of dividing a program composed of affordable media by a program which provides the best media for each of the tasks in the system. This ratio is obtained by first, forming a matrix for each of the three media related variables which contain the media selection scores (step two) for each task considered. Next, add the largest values for each task in the matrix. This produces a total score for the stimulus, response, and feedback matrices which are then summed to obtain the overall measure. This score represents the highest possible media effectiveness of the tasks which support the developing system and is the denominator used for all efficiency ratio (alternate program) calculations. The numerator for the ratio is obtained by summing the scores of the media used in the alternative training programs. These ratios are then compared to determine which alternative training program (alternative media combination) has the highest efficiency ratio (closest to one).[11] The most training effective program is judged on its cost implications to develop a final alternative training program recommendation.

The second method to estimate the effectiveness of a training program is the Analogous Task Method. This method compares tasks of the developing system to tasks from a fielded system. This comparison methodology

permits the analyst to predict the success of the training plan, to determine likely problem areas within the plan, and to develop alternative approaches for the problem areas.[12]

The analysis methodology first rates the task under consideration (the fielded system -analogous- task or the developing system task) in terms of several task descriptor variables. These are action verb type, initiating cues, general cue characteristics, visual cue characteristics, auditory cue characteristics, categories of feedback information, and feedback characteristics. Each task will contain a certain number of these task descriptor variables. Analogous tasks are selected for use in the next analysis step if their task descriptor variables closely match the developing system task. The methods of training the selected analogous tasks forms the analogous training program. This training program provides a good estimation of the training program for the developing system.

The final step in the analogous task method is to predict the effectiveness of the training program for the developing system. This prediction is established by obtaining performance data from the analogous training program developed in the first step. Soldier qualification test results, end of course performance

exams, and unit training results are all used to establish the effectiveness of the program.

The third method used to estimate the effectiveness of a training program is the TRAINVICE method. The TRAINVICE model has evolved between 1976 and 1980 into four versions.[13] TRAINVICE I, developed by Wheaton, Fingerman, Rose, and Leonard in 1976 predicted the effectiveness of a device by examining, at the subtask level, the fit of a proposed device in terms of task commonality, physical similarity, functional similarity, learning deficit and training technique. TRAINVICE II, developed by the office of the Project Manager for Training Devices (an Army Material Command Agency) in 1979 is a modification of the original TRAINVICE I model. Both models share the physical similarity and functional similarity analyses (although methods of determining a rating are slightly different). TRAINVICE II does not, however, assess the training techniques used in the device and TRAINVICE II penalizes a device for including features which are not required. TRAINVICE III, developed by Narva in 1979, revised the TRAINVICE I approach in an attempt to make the procedure more practical and flexible. This model evaluates a proposed device in terms of coverage requirement, coverage, training criticality, training difficulty, physical characteristics, and functional

characteristics. The final variant, TRAINVICE IV, is a modification of TRAINVICE III and was developed by Swezey and Evans in 1980. In this version training criticality was changed to training proficiency and some of the rating scales were modified to provide more guidance to users. In each model an effectiveness formula was used to compare a proposed device to training on the actual piece of the equipment.

The 1985 application of these models to Armor training devices by Harris, and others, suggests that "the simplest prediction method (TRAINVICE II) is the one to use since its predictions agree with the more complicated methods."[14] Therefore, the TRAINVICE methodology is presented in detail using the TRAINVICE II approach.

TRAINVICE II uses ratings on device characteristics and personnel and training requirements to establish an effectiveness index for the device or device concept. This index reflects the degree to which the device corresponds to the operational equipment, the extent of the training required, and the trainee ability level. Device characteristics are evaluated in terms of task commonality, physical similarity and functional similarity. The task commonality analysis evaluates whether or not a device trains a subtask. A task numerical score, for each device, is determined first by

assigning a 1 to subtasks that are covered by the device (or a 0 to subtasks that are not covered) and second by summing the subtask scores and dividing this subtotal by the sum of the total number of subtasks plus the number of elements the device has which are not required to train a required subtask. The formula is expressed as:

$$\text{Task Commonality Index} = \frac{\text{\# of 1's for device}}{\text{\# of req subtasks + \# of extra elements}}$$

The next step is to obtain a rating of the physical similarity between the device and the operational equipment. This is accomplished by rating, for each task, the degree of fidelity between the operational equipment's displays and controls and the device. The rating is based on a four point scale: 3 - identical; 2 - similar; 1 - dissimilar; 0 - missing. Task ratings for each device are then determined by adding the similarity scores together and then dividing this total by three times the number of controls and displays plus the number of controls or displays found on the device but are not required by the actual equipment. The formula is expressed as:

$$\text{Physical Similarity Index} = \frac{\text{sum of similarity ratings}}{\text{3(\# of req controls \& displays) + (\# of extra controls \& displays)}}$$

The third step is to assess the functional similarity of the device to the operational equipment. This

assessment evaluates whether or not the information flow between the operator and the device and the operator and the operational equipment is the same. As in the physical similarity analysis, the functional similarity analysis rates the controls and displays that are required to perform a certain task on a four point scale: 3 - identical; 2- similar; 1 - dissimilar; 0 - missing. The overall rating is established in the same manner as in the physical similarity index and uses the same formula.

The fourth step determines the student's baseline knowledge and skill before training on the task required for operation of the equipment and compares this knowledge and skill to what is required for successful performance of the task. Each task is broken down into its component skills and knowledge. Each skill and knowledge is then evaluated on a rating scale of 0 (no training) to 4 (complete understanding) in each of the two categories: before training and after training. A Skill and Knowledge Requirements Index is then obtained by summing the numerical differences between after training and before training and dividing this sum by four times the number of skills and knowledge in the task. The formula is:

$$\text{Skill \& Knowledge Requirements Index} = \frac{\text{Total difference score}}{4(\#\text{ of skills \& knowledge})}$$

The fifth step involves estimating the length of time

(an estimate of difficulty) it will take to train the task on the operational equipment. Again a 0 (requires no training time) to 4 (requires as much time to train as any task element) is used to rate each task element. A task training difficulty index is then obtained by summing the task element ratings and dividing this sum by four times the number of task elements. The formula is expressed as:

$$\text{Task Training Difficulty Index} = \frac{\text{Total training difficulty score}}{4(\#\text{ of task elements})}$$

In the sixth step, the analyst calculates an effectiveness score for each task. For each device the average of the task commonality (TC), physical similarity (PS), and functional similarity (FS) scores is obtained. This is obtained by: (TC + PS + FS)/3. The personnel and training requirements scores are independent of a particular device. Therefore each device is awarded the same personnel and training requirements score. The task score is obtained by: (SKR + TTD)/2, where SKR is the skill and knowledge requirements index and TTD is the task training difficulty index.

The final step is to obtain and compare the overall device effectiveness index for each device. The product, ((TC+PS+FS)/3)((SKR+TTD)/2), is obtained for each task. These products are then summed over all the tasks. This sum is then divided by the sum (over all the tasks) of the

personnel and training requirements score ((SKR+TTD)/2). This quotient is then multiplied by an excess task (feature) penalty quotient. The final formula is given by:

$$\text{Training Device Effectiveness Index} = \frac{\text{Sum of } ((TC+PS+FS)/3)((SKR+TTD)/2)}{\text{Sum of } (SKR + TTD)/2} \times \frac{\text{\# of req tasks}}{(\text{\# of req tasks}) + (\text{\# of extra features})}$$

These final scores, which range from 0 to 1, are then compared. The device or device concept with the highest score has the highest effectiveness potential.

The fourth method to estimate the effectiveness of a training program is Training Consonance Analysis. This analysis, developed by Hawley and Thomason (1978)[15], uses a training consonance ratio as a predictor of training effectiveness for a device or device concept. The analysis begins by using the initial analysis methodology in the Training Efficiency Estimation Model. Each task is compared with stimuli, response, information feedback logic, and functional context variables. A 1 is awarded to the variable if it applies to the task, a 0 if it does not. This analysis is called the task description. The training description is obtained by describing each task in terms of both stimulus, response, and feedback media found in a list of training equipment

and in terms of training methods found in a list of training methodologies. These data are then entered into a computer program which compares the task description (variables which describe the task) and the training description (variables which describe the media or method match to the proposed device). The output provides both the number of training deficiencies, excesses, and redundancies and a training consonance ratio (TCR). This ratio, TCR, is the quotient of the number of matches between the task characteristics and training description divided by the total number of task characteristics in that particular task. Generally speaking a TCR of less than .6 is not acceptable. The program will compute an overall TCR for the training program alternative. The program with the highest TCR is usually accepted (although further task level analysis can occur).

The training effectiveness comparison method developed in this project is designed to overcome the gaps found in the models available today. First, they do not consider embedded training as a training alternative. This is understandable since the models were designed before embedded training became a practical training alternative. TEEM and, by extension, TCR show the greatest promise for accepting embedded training into their present model structure. However, this is not a

simple matter. Embedded training can be viewed as both a training medium (e.g. flash cards, audio disc system, television system) and as a training method (e.g. lecture-team teach, programmed instruction, panels). Additional research must be conducted to establish the best way to incorporate embedded training into TEEM. Further, TEEM and TCR often result in a training alternative recommendation that consists of several different training medium. The training effectiveness comparison method permits a focused comparison of specific medium (up to 9 versus 38) without permitting the introduction of undesired medium. Second, most present day tasks are not trained using embedded training. Therefore, the Analogous Task Method cannot be used to compare today's training alternatives to embedded training since it relies on present training methods to suggest training alternatives for analogous tasks. Moreover, ATM does not account for new tasks which are not analogous to the fielded system. As more systems are fielded with embedded training subsystems the Analogous Task Method will become a more important training effectiveness comparison method. Finally, the TRAINVICE series of models could be used to compare embedded training to other training devices. Unfortunately, the TRAINVICE series of models rely on subtask information that is not available

at the early stage of the development cycle. Therefore, a detailed TRAINVICE comparison cannot be performed until after the initial embedded training decision is required.

Specific research into the unique nature of embedded training has begun. This U.S. Army Research Institute sponsored effort has generated procedures, described in ten volumes, which enable new systems developers to incorporate embedded training into their operational systems.[16] Chapter III presents a summary of that portion of the research effort that is appropriate to this project - the embedded training candidate task screening method.

CHAPTER III. EMBEDDED TRAINING - CURRENT SCREENING METHODS.

Roth, Sullivan, and Ditzian present a four phased process by which an analyst can determine what tasks on a new system are likely candidates for embedded training. Phase I defines the tasks that must be performed to operate the new piece of equipment. Phase II develops behavioral performance objectives and identifies how each performance objective will be evaluated for the tasks identified in Phase I. Phase III nominates, on the basis of criticality and perishability candidate tasks for embedded training. Additionally during this phase the analyst assesses the ability to implement the nominated tasks. Finally, Phase IV provides a procedure by which the analyst can document the data obtained during Phases I,II, and III.[17]

Phase I is a nine step process used to identify the tasks that personnel must be able to accomplish to operate the system. The first step is to gather information on the new system through available literature or information from subject matter experts. Next, the analyst identifies the job positions involved in the operation of the system. Third, the analyst identifies the missions (e.g. attack, defend) which must be performed by the new system. At the next step, the analyst establishes a

computer database and enters the data available thus far. The fifth step requires the analyst to identify the subcomponents of the missions identified in the third step. This is accomplished by a search through the available doctrinal literature and discussions with subject matter experts. Next, the analyst identifies mission subcomponents which are common to several missions. This is a bookkeeping step used to ensure that only unique subcomponents are analyzed in later steps. In the seventh step, each task which is performed while executing a subcomponent of a mission is identified (e.g. engage targets with the main gun from the gunner's position). The eighth step is similar to the sixth. In this step the analyst identifies the tasks which are common to several mission subcomponents. Finally the analyst identifies the crew position responsible for each task. The results of steps five through nine are entered in the database during each of these steps. The analyst is now ready for the detailed task analysis of Phase II.[18]

Phase II is an optional phase which depends on when the analysis takes place in the development of the new system. Roth, and others, point out that when using this methodology for identifying embedded training requirements

early in the system life cycle, specific data required for detailed task analysis likely will not be available. In this case the analyst can use the task level of information and proceed on to phase III. Ultimately the analyst should return to Phase II when the information becomes available.[19]

Phase II is a two step procedure. First, each unique task is analyzed to determine exactly how the operator performs the task and what stimuli is provided by the equipment during task performance. This step identifies the component subtasks, the required behavioral action, the amount of memorization required, and whether or not a subtask is mission or training (performed only in a training environment) related. The second step identifies the performance measure variables to be used to assess how well the tasks identified in the first step are completed. Some examples of these variables are: time or speed of performance, accuracy or error rate, safety considerations, process measures, and product measures. The specific numbered value of a variable is not important at this stage. Rather, the intent is only to identify the assessment criteria.[20]

The heart of the Roth, and others, procedure is the third phase. This phase identifies those tasks which are good candidates for embedded training. First, tasks are nominated if they are critical to mission success or if the soldier can easily lose required skills. The nominated tasks are considered further by the capability to implement training for the task within the embedded training subsystem of the combat system.[21] This phase III evaluation is divided into six steps.

The first step assesses how critical performance of a task is to mission accomplishment. To perform this step, subject matter experts are used to place each task in one of the following categories:[22]

High criticality - there is more than a 50 percent chance that mission failure will occur, equipment will be seriously damaged, or personnel will be injured or killed, if the task or objective is not performed correctly.

Moderate criticality - the percent chance of mission failure is between 25 and 50 percent.

Low criticality - the percent chance of mission failure is less than 25 percent.

Next, the analyst classifies each task based on seven categories of learning and retention characteristics. These categories are: integrated multiple skills performance; variable or contingency procedures; rule or concept utilization; invariant procedures; basic

manipulative skills; knowledges; and basic level behaviors.[23]

The third step of Phase III assigns a level of perishability to the categories used in the second step. Since the tasks have been assigned to one of the seven categories, this step identifies a general level of perishability of each task. Integrated multiple skills performance tasks are rated high perishability. Variable or contingency procedure and rule or concept utilization tasks are rated moderate perishability. The remaining four categories of tasks are rated low perishability.[24]

The fourth step nominates tasks to be considered for embedded training. Those tasks which are rated as high or moderately critical or high or moderately perishable are nominated as embedded training candidates.[25]

In the fifth step the analyst assesses if there are any unsuitable tasks for embedded training and of those remaining tasks which will require large amounts of resources to implement. This analysis uses a six to seven question algorithm to study methodically each nominated task. First, the analyst judges whether or not the stimuli (e.g. display screen) to perform the task on the equipment will be feasible. Second, the analyst decides whether or not use of embedded training to train the task

will result in a safety hazard or damage to the equipment. Next a decision is made as to whether or not meaningful performance measures can be obtained during the normal soldier/system interface accomplished during the execution of a task. For example, does the task require the soldier to type in a command or flip a switch which could be monitored by the embedded training system? Fourth, the analyst decides whether or not it is possible to obtain performance feedback from the embedded training system on a particular task. Will there be enough computer processing and storage available either in the system or the embedded training package? If not, can observers assess performance validly on that particular task? The fifth question determines if simulation is required (either static or dynamic) to provide the stimuli necessary to perform the task. If this simulation is required, then the analyst answers the sixth question. Is the simulation feasible or will the fidelity required in the simulation put implementation of this task at risk either due to cost or its technical presentation? If the answer is no for any of the questions then the task is not considered acceptable for embedded training.[26]

The final step in phase III is to conduct a review of the task nomination results to correct inconsistencies between higher level tasks and lower level tasks. Generally, if a lower level task is nominated for embedded training then its higher level task should also be nominated. If this is not the case then the analyst must examine the previous judgments to determine where the error was made.[27]

Phase IV of this procedure for developing embedded training requirements discusses how to automate the data obtained in phases I-III and presents a set of report formats which are useful in the overall analysis. The details and implementation of phase IV are not relevant to this project.

This four phased process provides an effective method to determine what tasks should continue to be considered for training by the embedded training alternative. It provides a rational, ordered process by which to isolate and study each of the new systems' tasks. It excludes tasks which, for several possible reasons, cannot be trained effectively by embedded training. And the method recognizes the important role mission accomplishment (criticality) and learning retention (perishability) play in selecting a training alternative.

However, this screening process by itself does not provide enough available information to the decisionmaker. The process provides no indication of how well a task selected for embedded training might be trained using a different alternative. Moreover, it does not address specifically how tasks ought to be trained if they are not selected as embedded training candidates.

CHAPTER IV. THE TRAINING EFFECTIVENESS COMPARISON METHOD.

This chapter develops the method used to compare embedded training to other training alternatives. Chapter I explained the need for such a method. Chapter II provided a research summary of the key methods available today to predict the effectiveness of training device or program alternatives. Chapter III provided the recently developed method for determining if a task is appropriate for training using the embedded training alternative. An overview of the training alternative comparison method is provided below:

Step 1: Identify the training tasks.

Step 2: Determine the embedded training candidate tasks (ARI screening process).

Step 3: Identify the training alternatives.

Step 4: Structure the problem (Saaty's Analytical Hierarchy Process).

Step 5: Obtain input data via subject matter expert questionnaire (training effectiveness criteria weighting and alternatives vs criteria ratings).

Step 6: Establish subject matter expert training alternative rankings (TOPSIS).

Step 7: Aggregate training alternative rankings (Borda function).

A discussion of each step is presented in the subsequent paragraphs.

The first step the training analyst must accomplish is to identify the training tasks necessary to operate the new operational system (e.g. tank, truck or command and control system). This is often accomplished by agencies outside the office directly responsible for the training analysis accomplished during the Preliminary Training Effectiveness Analysis. If the task list for the new system is not provided then the analyst has several alternatives. Phase I of the ARI screening process (described in Chapter III) can be used to develop the task list. Another, less desirable method, is to develop a task list by identifying a similar existing system and developing an analogous task list for the new system.[28]

Next, the analyst determines the tasks which are appropriate for embedded training using the ARI screening process. This process was described in detail in Chapter III. Phase III of this process provides the actual screening method. Use of this process will be demonstrated in Chapter V. This screening step in the training effectiveness comparison method is important. Since embedded training is a new training alternative little is know about its applicability to a certain task for a certain developing system. The screening step helps

to ensure that a task which is not suited for embedded training does not include the embedded training alternative during the later comparison steps. The counterpart methods for determining what present day training alternatives are appropriate for the task under consideration are discussed below (Step 3).

In step 3, the analyst identifies the training alternatives to compare against embedded training. Training alternatives are the instructional methods used to train the particular task under consideration. They can range from the traditional classroom setting through a full fidelity stand alone simulator (e.g. flight simulator). A discussion of training equipment, materials, and methods (which form alternatives) is provided by the Training Efficiency Estimation Model (TEEM) found in Chapter II and the Technique for Choosing Cost Effective Instructional Delivery Systems (TECEP).[29] The analyst may chose any number of alternatives which are appropriate for a particular task under consideration. However, the total number of alternatives should remain under ten.[30] Beyond this point several problems emerge. First, the size of the problem causes computational difficulty. Second, the size of the data collection instrument becomes overwhelming. And finally, when large numbers of training alternatives

are used it becomes difficult to distinguish (and present results to decisionmakers) between alternatives. Since the purpose of this project is to provide additional information about tasks considered appropriate for embedded training, embedded training will normally be considered as a training alternative. However, this method can also be used to identify the most appropriate training alternative for those tasks not considered appropriate for embedded training.

Once the training alternatives have been identified it is now possible to structure the problem (step 4). In our case, we seek a model which will permit us to evaluate, for a particular task, several training alternatives under a set of training effectiveness criteria with the ultimate goal of identifying the most effective training alternative. Saaty's Analytical Hierarchy Process (AHP) provides such a model.

The general form of the hierarchial structure used in the Analytical Hierarchy Process is:[31]

FIRST LEVEL	GOAL OR OBJECTIVE
SECOND LEVEL	CRITERIA (1 to 9)
THIRD through n-1 LEVEL	ADDITIONAL CRITERIA RELATED TO THE CRITERIA IN THE PREVIOUS LEVEL
FINAL LEVEL (nth LEVEL)	ALTERNATIVES

Saaty's model uses this hierarchial approach to break down a complex problem into pieces that can be more adequately evaluated. It provides an evaluation process which gives a decisionmaker the opportunity to choose, based upon certain criteria, an alternative which provides the best solution to attain a certain objective. The hierarchy is described by levels. The first level is the goal or objective of the decisionmaking problem. The second and subsequent intermediate levels (n-1) contain the criteria used to identify the alternatives. The final level consists of the alternatives used to attain the objective.

Our application of the hierarchial structure fixes the first and second levels of the structure. The first level is our objective: identifying the most effective training alternative for each task. The second level is comprised of the training effectiveness criteria used for evaluating each of the alternatives. Six criteria have been identified from the research summarized in Chapter II. They are stimuli presentation, response presentation, feedback presentation,[32] task commonality, physical similarity, and training time.[33] These criteria are discussed in the next six paragraphs.

Stimuli presentation (C_1) provides the analyst with an evaluation criterion used to judge the potential that alternatives have to present information for the

particular task under consideration. Based upon the analyst's (or subject matter expert) knowledge of the gunner's station of the Future Armored Combat System and his knowledge of predecessor systems, he determines what type of stimuli is required to perform the task under consideration. The types of stimuli are visual cues, audio cues, tactical cues, external stimulus motion cues, internal stimulus motion cues, olfactory cues, and gustatory cues. The analyst then judges the extent to which a particular training alternative can provide the required stimuli to perform the task.

The response presentation criterion is used to evaluate the extent to which the training alternatives permit a response to the information presented to the trainee or crewmember for the particular task under review. In this case, the analyst first determines what type of response is required of the operator to perform the task under consideration. This response can take one of the following forms: verbal, written, manipulative act, tracking, or procedural performance. The analyst then judges the extent to which a particular training alternative can accept that type of response.

The feedback presentation criterion is used to evaluate the extent to which the training alternatives can provide feedback to the operator. Again, the analyst

first determines the type of feedback required to reinforce correct performance or correct faulty performance on a particular task. This determination is made based upon the analyst's knowledge of: the gunner's station in the Future Armored Combat System, the gunner's station in predecessor systems, and the four training alternatives. Feedback presentation takes one of the following forms: visual, aural, written, face-to-face communication, indirect communication, tactile, kinesthetic, olfactory, and gustatory. The analyst then judges the extent to which a particular training alternative can provide the required feedback.

The task commonality criterion is used to evaluate the extent to which the training alternatives can train the subtasks (basic steps) of a particular task. The subtasks of a particular task are either provided to the analyst or the analyst makes an estimate of what the subtasks might be based upon his knowledge of the developing system and its predecessor systems. The analyst then estimates the percentage of subtasks a particular training alternative would be able to train.

The physical similarity criterion is used to evaluate the extent to which the representation of the displays and controls of the four training alternatives are similar to the displays and controls of the Future Armored Combat

System for a particular task under consideration. Since little is known of the developing system at this early stage of its development cycle, the analyst must determine if the particular training alternative has the potential to provide display and control physical similarity to what likely will be found in the gunner's station of the Future Armored Combat System.

The final criterion used to evaluate the effectiveness of a training alternative for a particular task is training time. This criteria is used to evaluate the length of training time required to train a particular task using one of the four training alternatives. It is not measured in absolute time (something a later field test would establish) but rather reflects a comparison among alternatives.

Therefore, the general hierarchial structure becomes:

```
                ----------------------------------
FIRST           |     TRAINING EFFECTIVENESS      |
LEVEL           |OF A PROPOSED TRAINING SUBSYSTEM|   OBJECTIVE
                ----------------------------------

             --------------   --------------   ------------
             |STIMULI      |  |FEEDBACK     |  |PHYSICAL   |
SECOND       |PRESENTATION|  |PRESENTATION|  |SIMILARITY|
LEVEL        --------------   --------------   ------------
                                                          CRITERIA
            --------------    ------------    ----------
            |RESPONSE     |   |TASK        |   |TRAINING|
            |PRESENTATION|   |COMMONALITY|   |TIME     |
            --------------    ------------    ----------

             ---------------         ---------------
             |ALTERNATIVE 1|         |ALTERNATIVE n|
THIRD        ---------------         ---------------
LEVEL                                                  ALTERNATIVES
                          ----------
                          |EMBEDDED|
                          |TRAINING|
                          ----------
```

Typical training alternatives will be incorporated when the model is demonstrated using a sample system.

Step 5 continues the Analytical Hierarchy Process. In this step, subject matter experts (a single training analyst or decisionmaker could also perform this step) establish a relationship between the criteria and the objective and the alternatives and the criteria.[34] First, the subject matter expert establishes the contribution of a particular criterion to achieve the objective. This is done through a pairwise comparison process to establish a numerical weight to each of the criteria. In this case, the relationship between criteria and objective can be expressed in matrix form:

Effective Training Alternative	SP	RP	FP	TC	PS	TT
SP	1					
RP		1				
FP			1			
TC				1		
PS					1	
TT						1

FP= Feedback Presentation
PS= Physical Similarity
RP= Response Presentation
SP= Stimulus Presentation
TC= Task Commonality
TT= Training Time

It turns out that the pairwise comparison matrix is reciprocal. This means that the comparison value for SP:RP is equal to 1/(comparison value for RP:SP) or $a_{ji} = 1/a_{ij}$. For this reason it is only necessary to make the comparisons for the top half of the matrix. In a

general sense, n(n-1)/2 establishes the necessary number of comparisons. In our case 15 comparisons [6(6-1)/2] are required out of a possible 30.

The subject matter expert begins by comparing the contribution stimuli presentation has to training effectiveness versus the contribution response presentation has to training effectiveness using an established comparison scale. This process is repeated through the 15 pairs in the top half of the matrix. The comparison scale is:[35]

THE PAIRWISE COMPARISON SCALE

Intensity of Importance	Definition	Explanation
1	Equal importance of both elements	Two elements contribute equally to training effectiveness
3	Weak importance of one element over the other	Experience and judgment slightly favor one criteria over the other
5	Essential or strong importance of one element over the other	Experience and judgment strongly favor one criteria over the other
7	Demonstrated importance of one element over the other	A criteria is strongly favored and its dominance is demonstrated in practice
9	Absolute importance of one element over the other	The evidence favoring one criteria over another is of the highest possible order of affirmation

2,4, 6,8	Intermediate values between two adjacent judgments	Compromise is needed between two judgments

Reciprocals

If the second item of comparison is the stronger contributor to training effectiveness then the score given in the comparison rating is the reciprocal value of the appropriate rating in the scale above (e.g. 1/3,1/5,1/6).

A few comments about this scale and the comparison process are appropriate at this point. If we knew the physical relationship of the criteria with respect to each training alternative (e.g. training time for embedded training for Task A was 27 minutes) then we could proceed directly to normalize the scores and solve the problem by one of several multiple attribute decisionmaking models. Moreover, the rankings established by these data would provide more real information about how much better one alternative was over another. Unfortunately, this type of concrete information is not available at this early stage of the development cycle. So what must be done is to establish a way of capturing experience, knowledge, and predictions of the future to decide which task is best trained by which training alternative. Saaty's approach can be used to do this.[36] The pairwise comparison process provides a logical, step by step process to help ensure our decisions about the effect each level has on the preceding level (e.g. criteria on the objective,

training alternatives on the criteria) remains consistent. In other words, if we say A is twice as important as B and B is three times as important as C, we do not say that C is twice as important as A. Saaty's scale also helps to ensure that responses are consistent by providing a standardized way of assigning relative importance for each of the pairs under consideration.[37] The alternative would be to assign arbitrary numbers - numbers which might well lose their original meaning after the numbers of comparisons increase.

Once the necessary 15 comparisons are established then they are entered into the criteria matrix shown earlier. The reciprocal values of the top half of the matrix form the entries for the bottom half. The weights are then estimated using the eigenvector method (this is possible since all matrices completed our hierarchial structure are square). The eigenvector method sets the determinant of $A - \lambda I = 0$ (A is the pairwise comparison matrix) and solves for the largest eigenvalue (which is the largest root of this characteristic equation) of A (i.e. λ max). The value for λmax is then used in the matrix equation $(A - \lambda \max I)\ w = 0$ to obtain the eigenvector w or weights. Many computer programs are available which compute the eigenvalue and eigenvector of a square matrix.[38]

The largest eigenvalue also is used to measure consistency of the comparisons in a particular comparison matrix. A measure of the "goodness" of these judgments is called the consistency index. This index measures the difference between our matrix of pairwise comparisons and a consistent matrix. It is the measure of deviation of the largest eigenvalue (λ max) of our matrix from the largest eigenvalue (n) of a consistent matrix. The consistency index is given by the formula: (λ max - n)/(n - 1). According to Saaty: "In general, if the number is less than 0.1, we may be satisfied with our judgments."[39] Saaty goes beyond this generalization and develops a consistency ratio. This ratio provides a comparison of the consistency index generated by the subject matter expert's pairwise comparisons and a random index. To establish a random index, Saaty and several colleagues randomly generated forced reciprocal matrices of rank order 1 through 11 using a sample size of 500. The 500 consistency indices for each of the 11 matrix groups were then averaged to obtain a random index for each rank order group. We are interested in the random index for a matrix of rank six - the criteria versus goal matrix - and a matrix of rank four - the training alternatives versus criterion matrix. The random index thus established for a matrix of rank six is 1.24 and a

matrix of rank four is 0.90. The consistency ratio is found by dividing the consistency index by the random index for the same order matrix. Saaty considers a consistency ratio of .1 or less acceptable.[40] Thus for a matrix of rank six, Saaty recommends that the consistency index be .124 or less (CI/RI = .1 or CI/1.24 = .1 or CI = .124) and for a matrix of rank four the consistency index be .09 or less (CI/RI = .1 or CI/.9 = .1 or CI = .09). Use of this number gives the decisionmaker an idea of the extent to which a subject matter expert has responded to the pairwise comparison in a random fashion. Failure to be below the 0.1 level does not mandate elimination of the data set. However, large values of the consistency index suggest that the particular comparison should be retried.

Saaty does provide several suggestions for attacking the problem of identifying which part of the comparison matrix to retry. One way is to form the matrix of priority ratios w_i/w_j, determine the matrix of absolute differences $[|a_{ij} - (w_i/w_j)|]$, and revise the judgment on the element(s) or row sums with the largest differences. Another way is to determine the root mean square deviation, $\sqrt{1/n \sum_{j=1}^{n} [(a_{ij}) - (w_i/w_j)]^2}$, for each of the i rows and remake the comparisons in the row with the largest value. Overuse of these procedures

can be counterproductive. Saaty's caution is: "We caution against excessive use of this process of forcing the values of judgments to improve consistency. It distorts the answer. One would rather have naturally improved judgments arising from expertise."[41] This is true in our case. Unless time is extremely limited, matrices with a high consistency index should be regenerated.

The pairwise comparison process is repeated to establish the effect the alternatives have on the criteria. In our application of the hierarchial structure a pairwise comparison matrix is formed for each criteria (C) with rows and columns formed by the number of alternatives. The general criterion matrix is:

Criterion (C1...Cn)	A1	A2	...	An
A1	1			
A2		1		
.			.	
.			.	
.			.	
An				1

The 1-9 rating scale is again used to complete the entries (a_{ij}) in the six criterion matrices (SP,RP,FP,TC,PS,TT) for each matrix the weights (ranking of alternatives) are established using the eigenvector method.

The sixth step establishes the subject matter

expert's ranking of training alternatives based upon the weights established in step 5. In our case (a model with three levels) Saaty's solution method is essentially the Simple Additive Weighting Method.[42] Step 5 has established two vectors of weights:

LEVEL 2: Criteria: Goal of Training Effectiveness

LEVEL 3: Training Alternatives: Criteria

$$B2 = \begin{array}{rc} & \begin{array}{c}\text{TE}\end{array} \\ \begin{array}{r}\text{SP}\\ \text{RP}\\ \text{FP}\\ \text{TC}\\ \text{PS}\\ \text{TT}\end{array} & \begin{bmatrix} w11 \\ w21 \\ w31 \\ w41 \\ w51 \\ w61 \end{bmatrix} \end{array} \qquad B3 = \begin{array}{rc} & \begin{array}{cccccc}\text{SP} & \text{RP} & \text{FP} & \text{TC} & \text{PS} & \text{TT}\end{array} \\ \begin{array}{r}\text{A1}\\ \text{A2}\\ .\\ .\\ .\\ \text{An}\end{array} & \begin{bmatrix} w11 & w12 & w13 & w14 & w15 & w16 \\ w21 & w22 & w23 & w24 & w25 & w26 \\ . & . & . & . & . & . \\ . & . & . & . & . & . \\ . & . & . & . & . & . \\ wn1 & wn2 & wn3 & wn4 & wn5 & wn6 \end{bmatrix} \end{array}$$

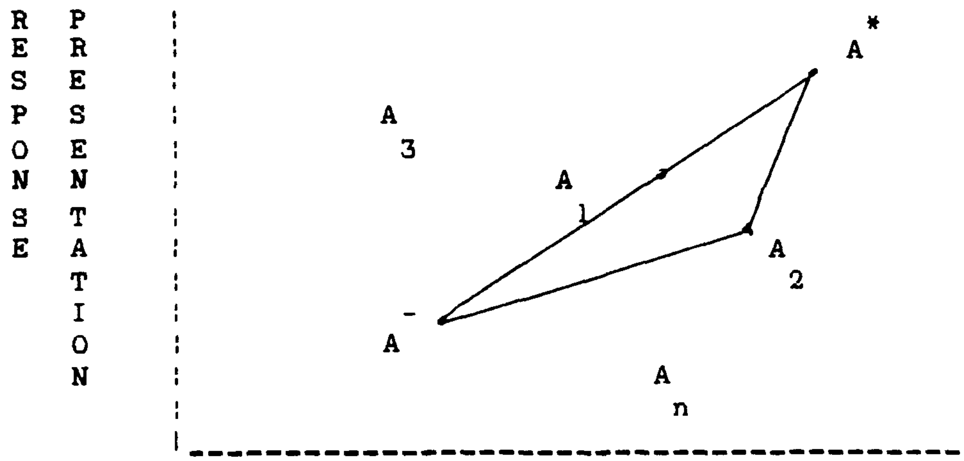
In Saaty's method these two matrices are multiplied to obtain the composite ranking of training alternatives:

$$W = B2B3 = \begin{array}{rc} \begin{array}{r}\text{A1}\\ \text{A2}\\ .\\ .\\ .\\ \text{An}\end{array} & \begin{bmatrix} w11 \\ w21 \\ . \\ . \\ . \\ wn1 \end{bmatrix} \end{array}$$

The alternatives are ranked by their composite numerical value (i.e. the highest wn1 is the most effective training alternative when compared to the other training alternatives).

Saaty's solution approach is simple and frequently quite sufficient. Occasionally, however, the composite vector will produce alternative weights which are equal.

To avoid this tie situation TOPSIS was selected over Saaty's solution approach to establish the individual subject mater expert training alternative rankings. TOPSIS is "[also] simple and yields an indisputable preference order of solution."[43] TOPSIS achieves this result by working under the principle that the selected alternative should have two properties. First, it should be closest to the best possible solution (called the ideal solution). Second, it should also be farthest from the worst possible solution (called the negative-idealsolution). This concept can be illustrated graphically:



STIMULUS PRESENTATION

If we look at the two dimensional comparison of the effect of stimulus presentation and response presentation on several alternatives (A_n) we can see that A_1 has

the shortest distance to the ideal solution (A^*) and the negative-ideal solution (A^-). However, A_2 is the same distance from the ideal solution as A_1 but is farther from the negative-ideal solution. In this case, A_2 is selected because it has the best of both properties. TOPSIS actually produces a number called the relative closeness to the ideal solution and it is this number that is used to rank order the alternatives (vice the weights used in the composite vector of Saaty's solution approach). TOPSIS is discussed in detail in Appendix C.

The final step (step 7) is to aggregate the input from several decisionmakers. The intent of this step is to provide the decisionmaker with a summary alternative ranking recommendation that accounts for the subject matter experts' experience, knowledge, and judgment. Hwang and Lin present a comprehensive survey of social choice methods of aggregating rank order input.[44] Some examples are the functions of Condorcet, Borda, Copeland, Nanson, Dodgson, and Kemeny. The Borda function was selected for our application because it is computationally simple and it gives positive credit to an alternative any time it is selected over another.

This positive credit is a key advantage of the Borda technique. Since data available at this early point in the developmental cycle actually reflect judgment vice

performance data obtained from a test, it is to our advantage to use as much information as possible. We want to know not only which alternative our subject matter experts' judgment and experience determine is the simple majority winner but also to what extent the other alternatives are favored over each other. The Borda technique helps us do that because it accounts for each choice of one alternative over another - be it between the first and second place alternative or the third and fourth place alternative. This is an improvement over methods which use the simple majority vote, penalize the alternative for losses, or attempt to gain a consensus ranking. It is an improvement because we have captured each piece of judgment and experience which has contributed to the ranking of one alternative over another and then aggregated that information across all the subject matter experts for a final alternative ranking.

The Borda function aggregation technique awards a different number of points to each alternative depending upon whether it was ranked first, second, third and so on. The points awarded are established by the rule: m-1, m-2,..., 1, 0 to the first, second, ..., last place alternative where m is the number of alternatives. The Borda score for a particular alternative is then established by summing the points awarded for that

alternative. The alternative with the highest number of points is declared the winner and the remaining alternatives are ranked in decreasing order of their total score.[45]

An example will illustrate the application of this technique. Let us assume we have four subject matter experts (SME) whose individual alternative rankings determined by TOPSIS were:

		SME 1	SME 2	SME 3	SME 4
R	1	A3 (3)	A4 (3)	A1 (3)	A2 (3)
A	2	A1 (2)	A1 (2)	A2 (2)	A3 (2)
N	3	A4 (1)	A3 (1)	A3 (1)	A1 (1)
K	4	A2 (0)	A2 (0)	A4 (0)	A4 (0)

The number in parenthesis is the Borda points awarded based on the application of the rule: (4 - 1) = 3, first place; (4 - 2) = 2, second place; (4 - 3) = 1, third place; and (4 - 4) = 0, last place. The Borda score for each alternative is:

$$\begin{aligned} A3 &= 3 + 1 + 1 + 2 = 7 \\ A1 &= 2 + 2 + 3 + 1 = 8 \\ A4 &= 1 + 3 + 0 + 0 = 4 \\ A2 &= 0 + 0 + 2 + 3 = 5 \end{aligned}$$

The final alternative ranking for the four subject matter experts is : A1 (8), A3 (7), A2 (4), A4 (4).

If ties exist in the individual rankings then the place finish is established by the lowest position had there been no tie. If there are three ties for first

place then the points awarded to all three tied alternatives is equal to the third place rule or m - 3. For example, a subject matter expert has the following ranking: first (tie) - A6, A4, A2; second - A1; third - A3, A5. His ranking without ties might be: first - A6, second - A4, third - A2, fourth - A1, fifth - A3, sixth - A5. Since the lowest ranking of the first place alternatives is third, alternatives A6, A4, and A2 are each awarded 6 - 3 or 3 points. The lowest ranking of the third place alternatives is sixth so A3 and A5 are awarded 0 points.

It is interesting to note that the final Borda score for an alternative reflects the number of times the four subject matter experts have picked a particular alternative over the other three alternatives. For example, SME # 1 has picked A3 over 3 other alternatives, SME # 2 and # 3 have picked A3 over one other alternative, and SME # 4 has picked A3 over 2 other alternatives. It is the knowledge and experience based judgment of the subject matter experts that has determined that A3 would be picked over other alternatives seven times. This more precise information of how an alternative fared against the other alternatives is what makes the Borda technique so valuable.

CHAPTER V. THE FUTURE ARMORED COMBAT SYSTEM: AN APPLICATION OF THE SCREENING PROCESS.

This chapter evaluates the Future Armored Combat System tasks using the Roth, Sullivan, and Ditzian four phased process identified in Chapter III. Phase I, which defines the tasks that must be performed to operate the new piece of equipment, has already been accomplished (it will no doubt be updated as the system evolves through its development cycle) by training analysts of the Training Division, U.S. Army Armor School (1987- see Appendix A). To provide a reasonable scope for the development of the training effectiveness methodology in the next chapter only the individual tasks for the gunner's station will be examined as potential embedded training candidates.

As discussed in chapter III, phase II is an optional phase performed when specific data required for detailed task analysis is available. Although materiel developers presently know what capabilities will be required of the Future Armored Combat System and have a general idea of what technologies will be used to accomplish those capabilities they do not yet know exactly how the operator will perform each task and what stimuli will be provided by the equipment during task performance. Phase II will therefore not be performed.

The third phase was performed. It is this phase which identifies the candidate tasks for embedded training. The results of this six step process are provided in Table 1. Tasks selected are identified with an asterisk.

TABLE 1. EMBEDDED TRAINING CANDIDATE TASK ANALYSIS FOR THE GUNNER'S POSITION ON THE FUTURE ARMORED COMBAT SYSTEM.

Task	Criticality	Learning & Retention Classification
Recover by similar vehicle	High	Contingency Procedure
Remove/Install Track Blk(s)	Moderate	Invariant Procedure
*Perform Before Operations Checks and Services	Moderate	Invariant Procedure
Perform During Operations Checks and Services	High	Invariant Procedure
Perform After Operations Checks and Services	Low	Invariant Procedure
Perform Gunner's Prep to Fire Checks & Services	High	Invariant Procedure
Perform Gunner's After Fire Checks & Services	Low	Invariant Procedure
Prepare Gunner's Station for Operation	High	Invariant Procedure
Secure Gunner's Station	Moderate	Invariant Procedure
*Troubleshoot the Fire Control System	Low	Contingency Procedure
Prepare Gunner's Weapon for Travel	Low	Invariant Procedure
*Evacuate a Wounded Crewman	Moderate	Multi Skills Performance
Extinguish a Fire	High	Rule Utilization
*Replace a Thrown Track	High	Rule Utilization
Operate the Gas Particulate System	High	Invariant Procedure
Boresight and System Calibrate	High	Invariant Procedure
Perform Manual Extract-ion Main Gun Round	High	Invariant Procedure
Prepare for Powerpack Removal	High	Invariant Procedure
Perform Operator Before C&S NBC System	High	Invariant Procedure
Inspect Main Gun Ammo for Serviceability	Moderate	Rule Utilization
Stow Ammunition	Moderate	Invariant Procedure

Perish-ability	Embedded Task ?	Implementation Feasibility and Approaches		
		On Equip Task Related Stimuli	Safety Problem	Can Perf Meas Be Defined
Moderate	Yes	Feasible	No	No
Low	Yes	Feasible	No	No
Low	Yes	Feasible	No	Yes
Low	Yes	Feasible	No	Yes
Low	No	Feasible	No	Yes
Low	Yes	Feasible	No	Yes
Low	No	Feasible	No	Yes
Low	Yes	Feasible	No	Yes
Low	Yes	Feasible	No	Yes
Moderate	Yes	Feasible	No	Yes
Low	No	Feasible	No	No
High	Yes	Feasible	No	No
Moderate	Yes	Feasible	No	Yes
Moderate	Yes	Feasible	No	No
Low	Yes	Feasible	No	Yes
Low	Yes	Feasible	No	Yes
Low	Yes	Feasible	No	No
Low	Yes	Feasible	No	No
Low	Yes	Feasible	No	No
Moderate	Yes	Feasible	No	No
Low	Yes	Feasible	No	No

Implementation Feasibility and Approaches				Final ET Assessment
Will Assess Be Positive	Can Personnel Assess Perf	Is Sim Needed	Is Sim Feasible	
No	Yes	No	NA	Yes. Off line asmt
No	Yes	No	NA	Yes. Off line asmt
Yes	Yes	No	NA	Yes
Yes	Yes	No	NA	Yes
Yes	Yes	No	NA	No
Yes	Yes	No	NA	Yes
Yes	Yes	No	NA	No
Yes	Yes	No	NA	Yes
Yes	Yes	No	NA	Yes
Yes	Yes	No	NA	Yes
No	Yes	No	NA	No
No	Yes	No	NA	Yes. Off line asmt
Yes	Yes	Yes	Yes	Yes
No	Yes	No	NA	Yes. Off line asmt
Yes	Yes	No	NA	Yes. Off line asmt
Yes	Yes	Yes	Yes	Yes. Off line asmt
No	Yes	No	NA	Yes. Off line asmt
No	Yes	No	NA	Yes. Off line asmt
No	Yes	No	NA	Yes. Off line asmt
No	Yes	No	NA	Yes. Off line asmt
No	Yes	No	NA	Yes. Off line asmt

Task	Criticality	Learning & Retention Classification
Refuel	Low	Invariant Procedure
*Engage Targets w/Main Gun from Gunner's Station	High	Variable Procedure
Perform Operator's Maint on Periscopes	Moderate	Invariant Procedure
Troubleshoot the NBC System	Moderate	Contingency Procedure
Adjust the Operating Cam on the Main Gun	Moderate	Rule Utilization
Perform Operator Maint on the Breechblk Assembly	Moderate	Invariant Procedure
*Adjust Crew Compartment Pressurization	Moderate	Rule Utilization
Load/Unload a Grenade Launcher	Moderate	Basic Manipulative Skill
Install/Remove a Coax Machinegun	High	Invariant Procedure
*Zero the Machinegun	Moderate	Contingency Procedure
*Engage Targets w/Coax from Gunner's Station	Moderate	Variable Procedure
Clear Mach Gun to Prevent Accidental Discharge	High	Contingency Procedure
Operate Over-Pressure System	High	Invariant Procedure
Prepare Vehicle for Fording Operations	High	Invariant Procedure
Clean/Service the Main Gun	Moderate	Invariant Procedure
Inspect the Hydraulics	High	Rule Utilization

Perish-ability	Embedded Task ?	Implementation Feasibility and Approaches		
		On Equip Task Related Stimuli	Safety Problem	Can Perf Meas Be Defined
Low	Yes	Feasible	No	No
Moderate	Yes	Feasible	No	Yes
Low	Yes	Feasible	No	No
Moderate	Yes	Feasible	No	No
Moderate	Yes	Feasible	No	No
Low	Yes	Feasible	No	No
Moderate	Yes	Feasible	No	Yes
Low	Yes	Feasible	No	No
Low	Yes	Feasible	No	No
Moderate	Yes	Feasible	No	Yes
Moderate	Yes	Feasible	No	Yes
Moderate	Yes	Feasible	No	No
Low	Yes	Feasible	No	Yes
Low	Yes	Feasible	No	No
Low	Yes	Feasible	No	No
Moderate	Yes	Feasible	No	No

Implementation Feasibility and Approaches				Final ET Assessment
Will Assess Be Positive	Can Personnel Assess Perf	Is Sim Needed	Is Sim Feasible	
No	Yes	No	NA	Yes. Off line asmt
Yes	No	Yes	NA	Yes
No	Yes	No	NA	Yes. Off line asmt
No	Yes	No	NA	Yes. Off line asmt
No	Yes	No	NA	Yes. Off line asmt
No	Yes	No	NA	Yes. Off line asmt
Yes	Yes	No	NA	Yes
No	Yes	No	NA	Yes. Off line asmt
No	Yes	No	NA	Yes. Off line asmt
Yes	No	Yes	Yes	Yes
Yes	No	Yes	Yes	Yes
No	Yes	No	NA	Yes. Off line asmt
Yes	Yes	No	NA	Yes. Off line asmt
No	Yes	No	NA	Yes. Off line asmt
No	Yes	No	NA	Yes. Off line asmt
No	Yes	No	NA	Yes. Off line asmt

The phase III analysis eliminated three of the thirty-seven tasks under review. Specifically, perform after operations checks and services, perform gunner's after fire checks and services, and prepare gunner's weapon for travel were eliminated because they were rated low in both the criticality and perishability categories. Of the remaining thirty-four, twenty-three were nominated as embedded training candidates requiring an off line training assessment capability. It is unlikely that the equipment found in the gunner's station will have the ability to keep track of the procedure the soldier would use to perform these twenty-three tasks. Eleven tasks were found to be appropriate for full embedded training. That is, it is likely that training, evaluation, and feedback can be provided by the equipment at the gunner's station for these eleven tasks.

Since trying to apply all tasks nominated for embedded training (34) to the demonstration of the training effectiveness methodology would complicate dramatically the intent of this project, I will restrict further analysis to the following eight tasks:

- Perform before operations checks and services
- Troubleshoot the fire control system
- Evacuate a wounded crewman

- Replace a thrown track

- Engage targets with the main gun from the gunner's station

- Adjust crew compartment pressurization

- Zero the machinegun

- Engage targets with the coax from the gunner's station

This task selection provides a mix of full embedded training tasks, embedded training tasks with off line assessment, and a mixture of the other analysis categories (e.g. criticality, learning and retention classification).

CHAPTER VI. SETTING UP THE PROBLEM: ALTERNATIVES, PROBLEM STRUCTURE, INPUT DATA (STEPS 3,4,5).

Now that we have established training candidate tasks (previous chapter) we want to investigate, step 3 of the training effectiveness comparison method is to identify other training alternatives to compare against embedded training. For this demonstration three additional training alternatives were chosen. They are: classroom or unit instructor based instruction (IB); part task, computer based instruction (CBI); and full function stand alone trainers (FFSAT). These are major training alternatives in use today and are defined in the next four paragraphs.

Classroom or unit instructor based instruction (A_1) is the traditional training given by an instructor. Both small group instruction (anywhere from 1:6 to 1:16 instructor to student ratio) and large group instruction (1:17 to 1:60 instructor to student ratio) are included in this category. Instructors provide instruction through traditional audio-visual means. This includes blackboards, overhead projectors, 35mm slide projectors, films, video tapes, guest speakers and panel discussions. Student performance evaluation ranges from instructor subjective opinion of classroom contribution through practical exercises to graded individual papers and

written or hands on (hands on the actual piece of equipment) performance examinations.

Part task, computer based instruction (A_2) ranges from instruction provided by a table top personal computer through a learning station linked to a mainframe computer to a table top computer based delivery system specifically designed for training. This latter subcategory includes systems such as the Electronic Information Delivery System (which provides enhanced learning through a touch screen display vice a pure keyboard operation) and the Video Disc Gunnery Simulator (a table top videodisc based trainer designed to familiarize a tank gunner with the fire control equipment at his crew station and train the tasks engage the target with the main gun and coax machinegun from the gunner's station under varying combat conditions). Instructors or facilitators are present for the instruction but only provide answers to specific student questions on lesson content, operation of the computer providing the instruction, or direct movement to the next training step (when the computer cannot perform this function). This category can include collective trainers whose function is to train partial task groupings or parts of individual tasks without fully replicating the actual piece of equipment or crewmember station. A good example of this is the Combined Arms Tactical Trainer

(often referred to as Simulation Networking - SIMNET). This trainer trains crews in collective gunnery and tactical tasks by providing only the required fidelity necessary to train the tasks chosen for training.

Full function stand alone trainers (A_3) are designed to replicate, to the extent technology will allow, performance on a task in the same way as it is performed on the operational equipment. They are also designed to replicate the physical environment of the crewmember's station (knobs, controls, switches, seats, legroom, etc.). Good examples of these type of trainers are flight simulators for helicopters and fixed wing aircraft and for the tank or Bradley Fighting Vehicle (BFV) - the Unit Conduct of Fire Trainer (UCOFT). The UCOFT replicates the physical characteristics of the vehicle commander and gunner positions and uses a computer driven matrix of 685 increasingly difficult exercises to train vehicle commander and gunner teams on target engagement techniques. These stand alone trainers are frequently quite similar to their embedded training counterparts with one notable exception. It is usually not possible to replicate the conditions of weather which would affect human performance on a task. For example, flight simulators and the UCOFT are enclosed in environmentally controlled rooms or shelters, so the

temperature and humidity which may effect a tank crew's performance on a task outdoors is not replicated in the simulator. These full function stand alone trainers often have limited accessibility since they would not be produced in the same quantities as would the operational equipment (a function of cost). Instructors or operators are present for the training but facilitate the students progress through the training software rather than provide the training themselves. These trainers would either provide their own performance evaluation and feedback or would be supplemented by an instructor or operator to provide any additional required evaluation or feedback on task performance.

Embedded training is the fourth alternative. Embedded training was defined in Chapter I. Instructors or facilitators can be present for the task training provided by an embedded training capability but do not present the training. They perform the same role as in alternatives two and three. Feedback may be provided by the embedded training capability itself or by an instructor or facilitator designated to observe the training.

The method goal and training effectiveness criteria were established in Chapter IV. Now that we have identified the training alternatives to rank we can

complete the hierarchial structure (step 4):

```
              -----------------------------------
FIRST         |     TRAINING EFFECTIVENESS      |
LEVEL         |OF A PROPOSED TRAINING SUBSYSTEM|    OBJECTIVE

   -------------- -------------- ------------
   |STIMULI      | |FEEDBACK     | |PHYSICAL  |
   |PRESENTATION| |PRESENTATION| |SIMILARITY|
SECOND
LEVEL      --------------  -------------  ----------CRITERIA
           |RESPONSE     |  |TASK        |  |TRAINING|
           |PRESENTATION|  |COMMONALITY|  |TIME    |

   -------------------      ---------------
   |CLASSROOM OR UNIT|      |PART TASK      |
   |INSTRUCTOR BASED |      |COMPUTER BASED|
   |INSTRUCTION      |      |INSTRUCTION    |
THIRD
LEVEL                 --------------     ---------     ALTERNATIVES
                      |FULL FUNCTION|    |EMBEDDED|
                      |STAND ALONE  |    |TRAINING|
                      |TRAINERS     |
```

Step 5 of the training effectiveness comparison method is to develop the questionnaire and obtain the subject matter expert pairwise comparisons used to establish the effectiveness of the four training alternatives under each of the six criteria for each of the eight tasks chosen. I have addressed specifically the comparison matrix used to establish the relationship between the criteria and the goal and the rating scale used to make those comparisons in Chapter IV. The general alternative versus criteria matrix shown in Chapter IV now becomes:

Criterion (C1...C6)	A1	A2	A3	A4
A1	1			
A2		1		
A3			1	
A4				1

So we have six comparison matrices (i.e., stimuli presentation, response presentation, feedback presentation, task commonality, physical similarity, and training time) which require six comparisons (A1:A2, A1:A3, A1:A4, A2:A3, A2:A4, A3:A4). The remaining six comparisons are the reciprocal value of those just established.

Thus, the subject matter expert must make 15 comparisons to establish the importance of the six criteria to the overall goal and 36 comparisons for each of the eight tasks considered. The questionnaire used is found at Appendix B.

The questionnaire return rate was 60%. This was lower than the 80% anticipated. Twelve questionnaires were mailed for data collection. Ten returns were requested (the two extras were provided in the off chance that additional SMEs might be available). Of these ten, six questionnaires were returned.

Appendix D provides the subject matter experts' responses to the questionnaire (Appendix B). It also provides each eigenvector calculation of the alternatives with respect to each of the six criteria. As discussed in

Chapter IV, the eigenvector method solves for the largest eigenvalue to eventually obtain the weights provided in Appendix D. The largest eigenvalue is used to establish a consistency index. The consistency index provides an assessment of the degree of logic in the subject matter experts judgment applied in completing a pairwise comparison matrix. The training effectiveness comparison method using six criteria requires six pairwise comparison matrices for each of the eight tasks considered. An additional pairwise comparison matrix is required for each subject matter expert to establish the relative importance (weights) of the six criteria to the goal (training effectiveness). In our case there were 294 pairwise comparison matrices each with a consistency index. For example subject matter expert # 1 evaluated Task A by establishing an alternative versus criteria comparison matrix for each of the six criteria. Since SME #1 evaluated eight tasks his total number of alternative versus criteria comparison matrices was (8)(6) or 48 comparison matrices. To this total SME #1 also generated a criteria versus training effectiveness comparison matrix to establish the weights of the criteria. Therefore, SME #1 established 48+1 or 49 total comparison matrices. Data from six subject matter experts were used in this demonstration. Therefore the total number of comparison

matrices was (6)(49) or 294. Appendix G provides a detailed analysis of the 294 consistency indexes. Our interest is to determine the extent to which and in what proportion the consistency indexes exceed .09 for the 288 alternative versus criterion matrices and .124 for the six criteria versus goal matrices. The results are as follows: (Note: the consistency indexes for the six criteria versus goal matrices are included in this summary and are also shown in the summary of the results of the subject matter expert comparisons of the criteria):

FREQUENCY DISTRIBUTION

FROM	TO	FREQUENCY	PERCENT
0.0	.1	187	63.6
.1	.2	62	21.1
.2	.3	20	6.8
.3	.4	10	3.4
.4	.5	1	.3
.5	.6	5	1.7
.6	.7	4	1.4
.7	.8	1	.3
.8	1.0	0	0
1.0	1.1	1	.3
1.1	1.2	1	.3
1.2	1.8	0	0
1.8	1.9	1	.3
1.9	2.0	0	0
2.0	2.1	1	.3

These results show that 61.6% (178/283) of the consistency indexes (see also the ordered output in Appendix G) computed for the alternative versus criterion martrices (rank 4) were below the .09 level Saaty suggests we can be satisfied with. If we expand that range to .2

then we have captured 82.6% (238/288) of the data. And if we expand up to .3 then 89.6% (258/288) of the pairwise comparison matrices have an acceptable consistency index. The six consistency indexes from the criteria versus goal comparison matrices (see first chart in Chapter VII) were: .031, .085, .198, .116, .327, and .026. Sixty-six percent (4/6) were under the .124 consistency index level recommended for a matrix of rank 6. If we expand the range to .3 then 83.3% (5/6) of the pairwise comparison matrices have an acceptable consistency index.

CHAPTER VII. INDIVIDUAL (TOPSIS) AND AGGREGATE (BORDA) ALTERNATIVE RANKINGS (STEPS 6 & 7).

Step 6 of the training effectiveness comparison method is to establish the subject matter expert individual training alternative rankings using the Technique for Order Preference by Similarity to the Ideal Solution (TOPSIS). Appendix E provides the TOPSIS rankings for each subject matter expert's evaluation of each of the eight tasks. Step 7 of the training effectiveness comparison method aggregates the individual preference rankings into an overall ranking of alternatives for each task under consideration using the Borda aggregation technique. The overall ranking established by the Borda aggregation of the six subject matter experts' individual rankings is found at Appendix F. The alternative ranking for each of the eight tasks under consideration is provided.

The results will be summarized shortly. But first a discussion of the criteria weights established by the subject matter experts is appropriate. These weights must be established to conduct the second step of TOPSIS - construct a weighted normalized decision matrix. The chart below summarizes the results of the eigenvector estimation of the subject matter experts' judgment on the importance of each criteria with respect to the overall

goal of achieving an effective training alternative:

SUBJECT MATTER EXPERTS

RANKING	#1	#2	#3	#4
R 1	TC(.39)	TC(.35)	SP(.24)	TC(.24)
A 2	SP(.16)	PS(.22)	RP(.23)	TT(.24)
N 3	RP(.16)	TT(.21)	FP(.23)	FP(.16)
K 4	FP(.16)	FP(.13)	TC(.12)	PS(.15)
I 5	PS(.07)	RP(.05)	PS(.12)	SP(.11)
N 6	TT(.04)	SP(.04)	TT(.05)	RP(.11)
G	c=.031	c=.085	c=.198	c=.116

SUBJECT MATTER EXPERTS

RANKING	#5	#6
R 1	SP(.34)	FP(.40)
A 2	FP(.27)	TC(.16)
N 3	TC(.12)	TT(.16)
K 4	PS(.12)	PS(.14)
I 5	RP(.09)	RP(.08)
N 6	TT(.07)	SP(.06)
G	c=.327	c=.026

FP= Feedback Presentation SP= Stimulus Presentation
PS= Physical Similarity TC= Task Commonality
RP= Response Presentation TT= Training Time
c= consistency index

The columns of this chart provide each subject matter expert's weighted criteria. Rows 1 through 6 represent the rank order of each criteria. At the bottom of each column is the consistency index of the subject matter expert's judgement for the ranking and weights established. The number in parenthesis is the weight for that particular criteria. For example, SME #1 ranked task commonality the most important criteria with a .39 weight. Training time was ranked least important with a .04 weight.

An example will illustrate how these weights were established. The answers to questions 1 through 15 of Section III of the questionnaire (Appendix B) provide the subject matter experts' pairwise comparisons of the criteria with regard to the overall goal of training effectiveness. The eigenvector pairwise comparison section of the TOPSIS output sheet in Appendix E provides the responses of each of the six subject matter experts to those 15 pairwise comparisons. For example, subject matter expert #1 had the following criteria versus effectiveness comparison matrix:

The Eigenvector Pairwise Comparisons

	Sti	Res	Fee	Tas	Phy	Tng
Stimuli	1.0	1.0	1.0	.33	3.0	4.0
Response	1.0	1.0	1.0	.33	3.0	4.0
Feedbac	1.0	1.0	1.0	.33	3.0	4.0
Task Co	3.0	3.0	3.0	1.0	5.0	5.0
Phy Sim	.33	.33	.33	.20	1.0	3.0
Tng Tim	.25	.25	.25	.20	.33	1.0

The DM subjective weights section of the SME # 1 TOPSIS output sheets provide the resulting eigenvector estimation of those weights:

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.16	0.16	0.16	0.39	0.07	0.04

These weights are the numbers in parenthesis shown in the subject matter expert weights summary chart for SME # 1.

The TOPSIS individual ranking results provided in

Appendix E and the Borda aggregation of those rankings found in Appendix F are summarized for each of the eight tasks.

TASK A: PERFORM BEFORE OPERATIONS CHECKS AND SERVICES

SME INDIVIDUAL RANKING TOPSIS

RANKING	#1	#2	#3	#4
1	IB(.61)	ET(.67)	ET(1.0)	IB(.71)
2	ET(.49)	SA(.54)	SA(.40)	CB(.44)
3	SA(.47)	IB(.36)	CB(.11)	SA(.43)
4	CB(.12)	CB(.14)	IB(.00)	ET(.32)

RANKING	SME INDIVIDUAL RANKING TOPSIS #5	SME INDIVIDUAL RANKING TOPSIS #6	SME AGGREGATE RANKING Borda
1	ET(.58)	ET(.84)	ET (14)
2	CB(.56)	SA(.77)	SA (9)
3	SA(.35)	CB(.19)	IB (7)
4	IB(.03)	IB(.16)	CB (6)

CB= Computer Based Instruction   ET= Embedded Training
IB= Instructor Based Instruction
SA= Stand Alone Trainer

This chart provides, for Task A, the individual SME (#1-#6) training alternative rankings in each column. The last column provides the Borda aggregate ranking for all six subject matter experts. The rows are rank ordered 1 through 4. The number in parenthesis is the TOPSIS c value or relative closeness to the ideal solution. For example, SME #1 has instructor based training ranked first

with a c value of .61. His last choice is computer based instruction with a c value of .12. The number in the parenthesis of the Borda aggregate column is the Borda score awarded to that alternative. In this case, ET was selected first with a Borda score of 14.

Again, an example will better illustrate how these results were established. Let us look at SME # 1 and his evaluation of the training alternatives with respect to Task A. The answers to questions 1 through 36 under Task A of Section V of the questionnaire (Appendix B) provide the subject matter expert's pairwise comparisons of the four training alternatives with regard to each of the six criteria for Task A. These six comparison matrices for SME # 1's evaluation of Task A are provided by the first data sheet of Appendix D. Note that the responses to questions 1 through 36 are provided by the top diagonal halves of the six matrices. The weights of each alternative with respect to each criteria are established using the eigenvector estimation method. The DM subjective weight section provides those weights (e.g. the weights established for the alternatives versus stimuli presentation are: IB - .05, CBI - .15, FFSAT - .35, ET - .46). These values are used to establish the decision matrix required by Step 1 of TOPSIS. The first TOPSIS output sheet (Appendix E) demonstrates how this decision

matrix is formed. The decision matrix is found in the first section of the output sheet. Notice that the first column of the matrix - stimuli presentation - has the same values as the weights established by the eigenvector estimation for the alternatives versus stimuli presentation shown above. The remaining 5 columns of the matrix are completed using the DM subjective weights for the second through sixth comparison matrices found on the first output sheet in Appendix D.

We can follow the progression of Steps 3 through 6 of TOPSIS by returning to the first TOPSIS output sheet in Appendix E . Step 3 is provided by the ideal solution and negative-ideal solution section of the output sheet. Steps 4 and 5 are calculated within the program. Step 6 - rank the preference order - is provided by the relative closeness to the ideal solution section of the output sheet. In our example the ranking was established by decreasing relative closeness to the ideal solution or c value as shown: instructor based instruction - .61, embedded training - .49, stand alone trainer - .47, and computer based instruction - .12. This is the same ranking and c value listing shown for SME # 1 under the subject matter expert summary chart for Task A . The final column of the summary chart provides the Borda ranking (first section) found in Appendix F. Note that

the Borda points shown in parenthesis of the summary chart match those shown in the Task A section of Appendix F.

TASK B: TROUBLESHOOT THE FIRE CONTROL SYSTEM

SME INDIVIDUAL RANKING TOPSIS

RANKING	#1	#2	#3	#4
1	IB(.61)	ET(.71)	ET(1.0)	IB(.93)
2	ET(.49)	SA(.56)	SA(.58)	CB(.67)
3	SA(.47)	IB(.37)	CB(.19)	ET(.23)
4	CB(.12)	CB(.12)	IB(.00)	SA(.09)

RANKING	SME INDIVIDUAL RANKING TOPSIS #5	#6	SME AGGREGATE RANKING Borda
1	CB(.68)	ET(1.0)	ET (14)
2	ET(.57)	SA(.74)	SA (8)
3	SA(.16)	CB(.18)	IB (7)
4	IB(.03)	IB(.03)	CB (7)

CB= Computer Based Instruction ET= Embedded Training
IB= Instructor Based Instruction
SA= Stand Alone Trainer

TASK C: EVACUATE A WOUNDED CREWMAN

SME INDIVIDUAL RANKING TOPSIS

RANKING	#1	#2	#3	#4
1	ET(.89)	SA(.54)	IB(1.0)	IB(.56)
2	SA(.81)	ET(.49)	CB(.38)	ET(.44)
3	IB(.47)	IB(.48)	SA(.08)	CB(.40)
4	CB(.19)	CB(.26)	ET(.00)	SA(.39)

RANKING	SME INDIVIDUAL RANKING TOPSIS #5	SME INDIVIDUAL RANKING TOPSIS #6	SME AGGREGATE RANKING Borda
1	ET(1.0)	ET(.82)	ET (13)
2	IB(.31)	SA(.52)	IB (11)
3	CB(.10)	IB(.15)	SA (8)
4	SA(.03)	CB(.15)	CB (4)

TASK D: REPLACE A THROWN TRACK

RANKING	SME INDIVIDUAL RANKING TOPSIS #1	#2	#3	#4
1	SA(1.0)	ET(.71)	ET(1.0)	CB(.83)
2	ET(.38)	SA(.56)	SA(.69)	IB(.75)
3	CB(.18)	IB(.37)	CB(.02)	SA(.13)
4	IB(.00)	CB(.12)	IB(.00)	ET(.10)

RANKING	SME INDIVIDUAL RANKING TOPSIS #5	SME INDIVIDUAL RANKING TOPSIS #6	SME AGGREGATE RANKING Borda
1	ET(1.0)	SA(.82)	ET (13)
2	IB(.31)	ET(.64)	SA (11)
3	CB(.11)	CB(.19)	CB (7)
4	SA(.00)	IB(.04)	IB (5)

TASK E: ENGAGE TARGETS WITH THE MAIN GUN FROM THE GUNNER'S STATION

RANKING	SME INDIVIDUAL RANKING TOPSIS #1	#2	#3	#4
1	SA(1.0)	ET(.65)	ET(1.0)	ET(.58)
2	ET(1.0)	SA(.56)	SA(.74)	CB(.51)
3	CB(.42)	IB(.35)	CB(.24)	IB(.47)
4	IB(.00)	CB(.18)	IB(.00)	SA(.40)

RANKING	SME INDIVIDUAL RANKING TOPSIS #5	#6	SME AGGREGATE RANKING Borda
1	ET(.56)	ET(1.0)	ET (17)
2	SA(.55)	SA(.92)	SA (10)
3	CB(.49)	CB(.26)	CB (6)
4	IB(.06)	IB(.00)	IB (2)

CB= Computer Based Instruction ET= Embedded Training
IB= Instructor Based Instruction
SA= Stand Alone Trainer

TASK F: ADJUST CREW COMPARTMENT PRESSURIZATION

RANKING	SME INDIVIDUAL RANKING TOPSIS #1	#2	#3	#4
1	SA(1.0)	ET(.71)	ET(1.0)	SA(.59)
2	ET(1.0)	SA(.57)	SA(.67)	ET(.58)
3	CB(.41)	IB(.35)	CB(.19)	IB(.42)
4	IB(.00)	CB(.12)	IB(.00)	CB(.14)

RANKING	SME INDIVIDUAL RANKING TOPSIS #5	#6	SME AGGREGATE RANKING Borda
1	CB(1.0)	ET(.77)	ET (15)
2	ET(.20)	SA(.47)	SA (12)
3	SA(.20)	CB(.19)	CB (6)
4	IB(.00)	IB(.09)	IB (2)

TASK G: ZERO THE MACHINEGUN

RANKING	SME INDIVIDUAL RANKING TOPSIS #1	#2	#3	#4
1	SA(1.0)	ET(.65)	ET(1.0)	ET(.53)
2	CB(1.0)	SA(.56)	SA(.67)	SA(.49)
3	ET(1.0)	IB(.35)	CB(.19)	IB(.49)
4	IB(.00)	CB(.18)	IB(.00)	CB(.45)

		SME INDIVIDUAL RANKING TOPSIS		SME AGGREGATE RANKING Borda
R A		#5	#6	
N				
K	1	CB(1.0)	ET(1.0)	ET (14)
I	2	SA(.42)	SA(.77)	SA (11)
N	"	ET(.24)	CB(.21)	CB (6)
G	4	IB(.00)	IB(.02)	IB (2)

CB= Computer Based Instruction ET= Embedded Training
IB= Instructor Based Instruction
SA= Stand Alone Trainer

TASK H: ENGAGE TARGETS WITH THE
COAX FROM THE GUNNER'S STATION

SME INDIVIDUAL RANKING

		TOPSIS			
R A		#1	#2	#3	#4
N					
K	1	SA(1.0)	ET(.65)	ET(1.0)	SA(.73)
I	2	ET(1.0)	SA(.56)	SA(.67)	ET(.64)
N	3	CB(.42)	IB(.35)	CB(.19)	CB(.28)
G	4	IB(.00)	CB(.18)	IB(.00)	IB(.27)

		SME INDIVIDUAL RANKING TOPSIS		SME AGGREGATE RANKING Borda
R A		#5	#6	
N				
K	1	CB(.56)	SA(.83)	ET (14)
I	2	ET(.49)	ET(.45)	SA (13)
N	3	SA(.41)	CB(.18)	CB (7)
G	4	IB(.05)	IB(.07)	IB (1)

CB= Computer Based Instruction ET= Embedded Training
IB= Instructor Based Instruction
SA= Stand Alone Trainer

TOPSIS alternative rankings are based on the relative closeness (c) to the ideal solution which is a measure of both the alternatives' closeness to the ideal solution and separation from the negative-ideal solution. When c=1 then that particular alternative is the ideal solution

($A_i = A^*$) and when c=0 that alternative is the negative-ideal solution ($A_i = A^-$). Task A provides an example of this. For SME #3, embedded training has a c value of 1 and instructor based instruction has a c value of 0. In this case embedded training is the ideal solution and instructor based training is the negative-ideal solution. The c value also gives an indication of how much better one alternative is over another and how close it is to the best (ideal) solution. However, this "betterness" is related to our rating scale rather than an absolute measure of training effectiveness. Our rating scale ranges from equal importance to absolute importance instead of time in seconds or absolute degree of task physical similarity with an alternative. One cannot predict the true outcome in terms of achieved training effectiveness when an operator uses a particular alternative to train on a task. In task C, SME #1 has ranked embedded training number 1 (.89), stand alone trainer number 2 (.81) and instructor based instruction number 3 (.47). This tells the decisionmaker that embedded training has a slight advantage (.08) over a stand alone trainer and a significant advantage (.42) over instructor based training.

The final column is the aggregate measure of the

individual rankings for each task. This aggregate ranking is provided by the Borda function. The number in parenthesis provides the sum of the points awarded for 1st, 2nd, 3rd, and 4th place finishes. This point total also gives the decisionmaker an idea of the "goodness" of an alternative. This is provided both by the point separation of the alternatives and the number 12. Twelve is the maximum value for a first place finish with four SMEs and four alternatives [4(m-1)= 4(3-1)= 12]. For example, embedded training is more strongly preferred by the subject matter experts evaluation of Task B (9) than it is for Task A (8) or Task C (8). Embedded training for Task B is also more preferred against instructor based instruction, stand alone trainers, and computer based instruction than it is for the same comparisons of point totals for tasks A and C. Again, we still cannot predict the training effectiveness which will be achieved by the operator. However, since the individual rankings are based against criteria which are components of an effective training alternative the method does give a decisionmaker a comparison ranking based upon training effectiveness.

CHAPTER VIII. CONCLUSIONS.

This chapter draws conclusions from the results of the method demonstration provided in Chapter VII. In addition to the overall conclusion the discussion includes consistency, criteria weights, use of TOPSIS and Borda, questionnaire sample size, combination of training effectiveness and cost, use of the method for project updates, and flexibility of the method.

The major conclusion from the results of the demonstration of this method is that it provides a workable solution to the problem of investigating training alternatives, especially embedded training, early in a system's development. It is not a simple method. But it does provide a framework for the analyst to organize the systematic study of the training alternative question. The recommendations provided in the next chapter provide an opportunity to reduce the amount of time necessary to apply this method to a developing system.

The results of the consistency index analysis give a guarded approval to the application of the training effectiveness comparison method. It is guarded because 38.1% (112/294) were beyond the range recommended by Saaty (.09 and .124). This means that conflicts in just over one-third of the data exist to force inconsistency. The question now becomes how much over the Saaty consistency

index levels are we willing to accept. In Chapter 4 the random indexes for matrices of rank four and six were discussed. These indexes (.9 and 1.24) were the average consistency indexes of 500 randomly generated pairwise comparison matrices. Saaty's recommended consistency index of .09 for a matrix of rank 4 (alternative versus criterion matrix) represents the top 11% of the most consistent matrices in the random sample. If we were willing to settle for less consistency, say the top 20 or 30 percent of consistency indexes in an estimated population of 4 X 4 matrices scaled 1 to 9 (which is our case) then the consistency index level drops to .18 and .27. The .27 level includes all but 10.7% (31/288) of the alternative versus criterion matrices. Since the 30 percent level includes a high percentage of the best consistency indexes within the estimated population of possible 4 X 4 matrices we can conclude that our data are sufficiently close to Saaty's recommended consistency level to be useful.

Therefore, the consistency indexes do suggest that the pairwise comparisons developed in the training effectiveness comparison method can produce usable results. Ninetv percent of the consistency indexes are within a reasonable level (top one-third) of consistency and just over 60% of the consistency indexes were below

Saaty's recommended level of 'good' consistency.

Yet sources of consistency errors did exist. First, subject matter experts may not have completely understood the definitions of the training alternatives, the criteria, or the tasks and how they affect the new system. This may have caused subtle changes in pairwise comparisons from one alternative (or one criteria) to the next. Second, some subject matter experts may have tried to generalize how the alternative or criteria was affected by initial or sustainment training rather than focusing on one or the other (Note: embedded training is normally associated with sustainment training). Since initial and sustainment training can affect the alternative versus criterion relationship differently, this may have also caused judgment inconsistencies in the pairwise comparison matrices. Third, the criteria are not completely independent. It is possible therefore that in some judgments the evaluation of an alternative with respect to each criteria may overlap. The extent to which this occurs is dependent upon the subject matter expert's understanding of the criteria. Finally, from looking at the repetitive nature of the responses toward the end of the long questionnaire it is apparent that the motivation of the subject matter expert decreased over time. This probably was normally caused by competing work priorities

rather than an unwillingness to complete the questionnaire properly.

Two conclusions may be reached when interpreting the results of the criteria weights established by the subject matter experts. First, no one criterion clearly dominates another (in fact many are equally weighted). Second, SME #3 and SME #5 have high consistency index values. If time had been available these subject matter experts should have remade their criteria pairwise comparisons.

The questionnaire sample size is a tradeoff between obtaining as much subject matter expertise (i.e. numbers of SMEs) and the practical reality of who is accessible, able, and willing. At a service school with a mission of developing a new system there are probably some 30 personnel who fit the qualifications for an SME capable of making training effectiveness comparisons. Those qualifications are expertise in a particular technical area, training alternatives, and the new system under investigation. It is possible to invoke statistical sampling rules to precisely determine what sample size is large enough to predict the effectiveness outcome within a certain margin of error and a probability of exceeding that margin of error for the entire population.[47] Unfortunately, in our application, this would be a tedious

process of determining the variances of questionnaire responses. This is not a necessary step since at this early stage of the development cycle we are not trying to predict actual effectiveness in the hands of the operator. What we are trying to do is provide the decisionmaker with enough data to make an informed decision. Given the availability of subject matter experts at the various service schools, ten to fifteen subject matter experts will provide a conservative sample size which represents one-third to one-half of the total population and provides an adequate sample size for a major study.

TOPSIS is one of a class of multiattribute decision making models for which cardinal information on the attributes is available. Others in the class are the Linear Assignment Method, the Simple Additive Weighting Method, the Hierarchial Additive Weighting Method, and the Elimination and Choice Translating Reality (ELECTRE).[48] TOPSIS is an effective model to use out of this class because it is simple to use and provides the best chance of a distinct alternative ranking. The Borda function technique is one of several available methods for aggregating alternative rankings. It was selected because the technique provides credit for each place finish except for last place. It accounts for the positive judgement in

favor of an alternative without penalizing an alternative for votes against it (which some methods specifically do). The point I want to stress here is that both methods are appropriate for this type of problem. They are not the only method which can be used to provide the individual and aggregate rankings. An investigation into the question of which method is the best for this application is not necessary since several methods will provide equally valid results. This is especially true when one remembers that the intent of this method is to obtain an estimated comparison of training alternatives at a stage when much concrete descriptive information is not available.

Armed with alternative rankings, the next step is to fold these rankings into early estimates of the cost of the various training alternatives for the developing system. This is arguably difficult to do since not only is the cost data an estimate but the *effectiveness* comparisons generated by this method do not transform to an actual prediction of how effective one alternative will be (the method predicts that one alternative will be more effective than another). This makes it difficult to establish a dollar relationship to training effectiveness. For example, if our alternative has a c value of .8 and is compared to an alternative which has a c value of .4, we

have a general feeling that the first alternative is twice as effective. Since we are not predicting the alternatives actual effectiveness, we are not able to say that we are only willing to pay half as much for the second alternative.

This method can also be used for project updates beyond its initial use for the first decision. Just as Phase II of the ARI screening process is implemented when more information becomes available so can the judgments from the subject matter experts be updated as more information becomes available. When actual training alternative hardware is produced and can be tested with the operational system then this method is no longer the preferred method to obtain an effectiveness comparison. Actual performance data should then be used to judge the effectiveness of the alternative under study.

Finally, a key advantage of this method is its flexibility. The hierarchial structure of the method permits the analyst determine both the criteria and alternatives to use for this early comparison of the effectiveness of training subsystems. I have, based upon research into current methods of predicting training effectiveness, presented the criteria I believe are most appropriate for this comparison problem. But changing the criteria with adequate justification does not destroy the

solution methodology. More importantly, the four alternatives used in the method demonstration can be changed to include the training alternatives appropriate for the developing system under investigation.

CHAPTER IX. RECOMMENDATIONS AND FUTURE RESEARCH.

The training effectiveness comparison model goes beyond current methods of assessing the effectiveness of training alternatives early in the development of a new system. It therefore provides a useful tool during the conduct of a preliminary training effectiveness analysis and should be implemented. Its actual utility will be in large part determined by the time available to complete the study and the availability of subject matter experts to participate in the data collection process. For a system with a large number of tasks the method requires a significant amount of time to collect and analyze the data. While this may be a disadvantage to analysts with limited time it is also an advantage because it forces an orderly detailed investigation into the training subsystem of a new system at precisely the time when the consideration of embedded training requires it - early.

In addition to the general recommendation that the method be implemented there are several specific recommendations that can be made as a result of the demonstration of the method. These are in the areas of data collection, the separation of initial and sustainment training, and the form of the questionnaire.

Several of the subject matter experts indicated the questionnaire was too long. One believed his consistency

suffered because he was forced to complete the questionnaire in several increments without refocusing on the criteria or tasks under consideration. Additionally, the repetitive nature of some of the data in the last several tasks evaluated indicates that the respondents tend to lose their focus on the pairwise comparison process after several hours of answering questions. For these reasons, I believe the best way to collect comparison data of this nature is in short spans of time. Therefore I recommend a shortened three part collection scheme. First, tasks should be evaluated in groups of three to four and if possible cover the same area of the operational system. Second, combat developers in coordination with the contractor for the system should provide a briefing on everything known about that portion of the system that affects the selected group of tasks. This briefing would be presented to the subject matter experts (these are experts on training vice the system) chosen for the preliminary training effectiveness study and last thirty to sixty minutes. Finally, about one to two hours would then be spent by the subject matter experts to establish their pairwise comparisons on the selected group of tasks. The idea is not to overwhelm the experts who tend to lose concentration beyond two hours of pairwise comparisons. This short spurt also has the

possible advantage of keeping the subject matter experts focused on the specific tasks under consideration. The disadvantage of this approach is that it extends the number of days required to complete the evaluation of a major system. For example, the Future Armored Combat System has 274 individual and collective tasks. This means a complete evaluation of the system would take at least 69 days (or 14 weeks @ 5 days a week) for the data collection alone. Therefore a study of this magnitude should be scheduled over a period of about six months. The first two months would be used to identify training alternatives, design the questionnaire, and coordinate for data collection. Data collection would be conducted over the next three months. Data reduction, data analysis and preparation of the final report would occur during the final two months.

The second recommendation recognizes the difference in the types of learning involved in initial training and sustainment training. The method presented in this project can apply in both cases although the distinction was not made in the demonstration of the method. Future applications of the model ought to make this distinction. The training effectiveness criteria are still applicable but their relationship to the training alternatives often changes when one considers the best way to impart initial

knowledge. When evaluation time is short the focus ought to be on sustainment training since the unit setting is often the most cost effective environment for embedded training. This is so because of the large number (often one per student in a class) of operational systems that would be required to support an embedded training approach in a school system.

Third, the questionnaire as currently designed is overly repetitive. One respondent suggested that the generic question be posed and then followed by a chart version of the required six comparisons. For example:

STIMULI PRESENTATION:

To what degree does the first training alternative have to present information required to train the _(insert task)_ when compared to the second alternative [1-9]?

_____	Instr based instr	:	comp based instr	_____
_____	Instr based instr	:	stand alone trnr	_____
_____	Instr based instr	:	embedded training	_____
_____	Comp based instr	:	stand alone trnr	_____
_____	Comp based instr	:	embedded training	_____
_____	Stand alone trnr	:	embedded training	_____

This form of the questionnaire condenses the information presented and no longer uses the reciprocal rating scale.

Respondents need only determine which alternative is projected as dominant then place their rating on the side of the dominant rating scale. For example the entry:

__3__ Instr based instr : comp based instr __-__

would mean that instructor based instruction is dominant and is slightly favored over computer based instruction. This would shorten the time required to complete the questionnaire and may well improve the consistency of the response by providing the subject matter expert with a compressed presentation of his responses.

Future study should focus on the implications of the method's use when an alternative is added or deleted from the initial set of alternatives, on the importance of one level of consistency over another, and on the method's ability to predict actual training effectiveness. It is quite possible that at some stage of the study or the developmental cycle it may be necessary to delete an alternative from further consideration or to add a new alternative. Alternatives may be deleted because of a failure of a key technology to mature or because the cost becomes too high. Alternatives may be added because a technology matures faster than expected or additional dollars are available to the program. When an alternative is deleted it should only require the analyst to delete the comparisons made with the deleted alternative. In our

case if we delete full function stand alone trainers (A3) from one of the tasks under consideration the original pairwise comparison matrix:

Criterion (C1...C6)	A1	A2	A3	A4
A1	1			
A2		1		
A3			1	
A4				1

becomes:

Criterion (C1...C6)	A1	A2	A4
A1	1		
A2		1	
A4			1

It should be a simple matter to just delete the A1:A3, A2:A3, and A3:A4 comparisons from the data set and recalculate the eigenvector weights for the alternatives remaining (for each criterion). The question further research should investigate is whether or not the deleted alternative or added alternative would have influenced the rating scale used by the subject matter expert.

The true measure of the importance of one level of consistency over another for a matrix of a particular size (in our case a 4 X 4 or a 6 X 6) may be the point at which higher consistency index values change the rank order outcome provided by TOPSIS. Additional research into this question for our specific application may well provide the most appropriate consistency level beyond which pairwise

comparison matrices must be regenerated.

Finally, we know from earlier discussion that the method does not predict actual training performance that will result from the operator using a particular training alternative. If a correlation between TOPSIS c values or Borda points and the actual performance achieved can be established, then the predictive validity of this method can be determined and more direct cost effectiveness relationships can be established.

ENDNOTES

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APPENDIX A: FUTURE ARMOR COMBAT SYSTEM TASK LIST.

DRIVER

Start/Stop the Engine

Drive

Slave Start

Perform Fuel Transfer Procedures

Recover Tank by Similar Vehicle

Prepare Driver's Station for Operation

Secure Driver's Station

Operate the Night Vision Viewer in Driver's Hatch

Remove/Install Track Block(s)

Troubleshoot the Night Vision Viewer

Troubleshoot using Driver's Control Panel Warning and Caution Lights

Troubleshoot the Engine

Troubleshoot the Transmission

Troubleshoot the Personnel Heater

Troubleshoot the Gas Particulate Filter Unit

Perform Before-Operation Checks and Services

Perform During-Operation Checks and Services

Perform After-Operation Checks and Services

Stow Ammunition

Establish Silent Watch

Evacuate a Wounded Crewman

Extinguish a Fire

Service the Precleaner

Tow a Tank

Replace a Thrown Track

Operate the Gas Particulate Filter Unit

Refuel the Tank

Unlock Stuck Parking Brakes

Service the Air Induction System

Prepare for Power-pack Removal

Perform Before-Operation Checks and Services Tank NBC System

Inspect Main Gun Ammunition for Serviceability

Stow Main Gun Ammunition

Clean/Service the Main Gun

Inspect the Hydraulics

Troubleshoot the NBC System

Place the NBC System into Operation

Adjust Crew Compartment Pressurization

Stow Ammunition

Perform Operator Maintenance Tank Periscopes

Hook-up/Operate Mine Plow/Roller Assembly

Prepare Vehicle for fording Operations

Operate Over-Pressurization System

Load/Unload a Grenade Launcher

Perform Pre-operation Checks and Services (Auxiliary Power Unit) APU

Perform Before-Operation Checks and Services-APU

Perform During-Operation Checks and Services-APU

Perform After-Operation Checks and Services-APU

Troubleshoot the APU

Start Generator - APU

Shut down the Generator and Engine - APU

GUNNER

Recover Tank by Similar Vehicle

Remove/Install Track Block(s)

Perform Before-Operation Checks and Services

Perform During-Operation Checks and Services

Perform After-Operation Checks and Services

Perform Gunner's Preventive Maintenance Prepare-to-fire Checks and Services

Perform Gunner's Preventive Maintenance After-fire Checks and Services

Prepare Gunner's Station for Operation

Secure Gunner's Station

Troubleshoot the Fire Control System

Prepare Gunner's Weapon for Travel

Evacuate a Wounded Crewman

Extinguish a Fire

Replace a Thrown Track

Operate the Gas Particulate Filter Unit

Boresight and System Calibrate

Perform Manual Extraction of a Main Gun Round

Prepare for Powerpack Removal

Perform Operator Before Operations Checks and Services NBC System

Inspect Main Gun Ammunition for Serviceability

Stow Main Gun Ammunition

Clean/Service the Main Gun

Inspect the Hydraulics

Refuel

Engage Targets with the Main Gun from the Gunner's Station

Perform Operator Maintenance on Periscopes

Place the NBC System into Operation

Adjust Crew Compartment Pressurization

Stow Ammunition

Troubleshoot the NBC System

Troubleshoot the Main Gun

Adjust the Operating Cam on the Main Gun

Load/Unload a Grenade Launcher

Install/Remove a Coax Machinegun

Zero the Machinegun

Engage Targets with the Coax Machinegun from Gunner's Station

Clear a Machinegun to Prevent Accidental Discharge

Operate the Over-Pressurization System

Prepare Vehicle for Fording Operations

TANK COMMANDER

Recover by Similar Vehicle

Remove/Install Track Block(s)

Perform Before-Operation Checks and Services

Perform During-Operation Checks and Services

Perform After-Operation Checks and Services

Troubleshoot the Gas Particulate Filter Unit

Perform Tank Commander's Preventive Maintenance Prepare-to-fire Checks and Services

Perform Tank Commander's Preventive Maintenance After-fire Checks and Services

Troubleshoot the Fire Control System

Engage Targets with the Main Gun from Commander's Weapon Station

Perform Operator Maintenance on Periscopes

Stow Ammunition

Establish Silent Watch

Prepare Commander's Weapon Station for Operation

Secure Commander's Weapon Station

Install/Remove a Caliber .50 M2 HB Machinegun

Maintain a Caliber .50 M2 HB Machinegun

Boresight a Caliber .50 M2 HB Machinegun

Zero a Caliber .50 M2 HB Machinegun

Clear a Caliber .50 M2 HB Machinegun to Prevent

Accidental Discharge

Engage Targets with a Caliber .50 M2 HB Machinegun

Prepare Tank Commander's Weapon for Travel

Evacuate a Wounded Crewman

Extinguish a Fire

Replace a Thrown Track

Operate the Gas Particulate Filter Unit

Direct Main Gun Engagements

Direct Machinegun Engagements

Perform Manual Extraction of a Main Gun Round

Boresight and System Calibrate

Perform Operator Before Operations Checks and Services NBC System

Inspect Main Gun Ammunition for Serviceability

Stow Main Gun Ammunition

Clean/Service the Main Gun

Inspect the Hydraulics

Place the NBC System into Operation

Adjust Crew Compartment Pressurization

Perform Gunner's Preventive Maintenance Prepare-to-fire Checks and Services

Perform Gunner's Preventive Maintenance After-fire Checks and Services

Troubleshoot the Main Gun

Adjust the Operating Cam on the Main Gun

Perform Operator Maintenance on the Main Gun
Breechblock Assembly

Utilize Land Navigation System

Load/Unload a Grenade Launcher

Fire a Grenade Launcher

Engage Targets with the Coax Machinegun from the
Commander's Weapon Station

Operate the Over Pressurization System

Prepare Vehicle for Fording Operations

CREW TASKS

Perform Movement Security Using Smoke Systems

Protect Supplies from NBC Contamination

Perform a Nuclear Contaminated Area Crossing

Perform a Chemically Contaminated Area Crossing

Perform Chem Agent Early Warning Using Chem Agent
Alarm

Decontaminate Supplies and Equipment

Perform Assembly Area Activities

Install Thrown Track

Troubleshoot the Electrical Power System

Start Using Slave Cables

Operate the Over Pressure System

Boresight Without the Pye-Watson Device

Borsight Using the Pye-Watson Device

Execute Pre/Post-Fire Checks

Perform PMCS

Fight Fires

Tow a like Vehicle

Extract a Wounded Crewman

Refuel

Stow Ammunition

Engage Targets in the Degraded Mode

Engage Multiple Main Gun Targets

Engage Targets Simultaneously w/Main Gun and Machinegun

Engage a Target from Tank using Battlesight

Engage a COAX Target

React to Indirect Fire

Prepare for a Friendly Nuclear Strike

Employ Physical Security Measures

Employ Electronic Counter Countermeasures

Prepare a Sketch Range Card

Engage Targets from a Sketch Range Card Position

Employ Signal Security Measures

Take Countersurveillance Measures

Perform Actions Before an NBC Attack

Perform Actions During an NBC Attack

Perform Actions After an NBC Attack

Perform Actions When Operating in Areas of Residual Rad

Remove/Install Track Block(s)

Verify Calibration (Boresight)

Troubleshoot the Fire Control System

Troubleshoot the Over Pressure System

Prepare Vehicle for Operations

Secure Vehicle for Operations

Perform Operator Maint on Breechblock Assembly

SECTION TASKS

Perform Assembly Area Activities

Recover by Similar Vehicle

Engage Targets Using the Two Tank Method

Displace to Subsequent Battle Position

Occupy Covered and Concealed Positions

PLATOON TASKS

Protect Supplies from NBC Contamination

Perform a Nuclear Contaminated Area Crossing

Perform a Chemically Contaminated Area Crossing

Perform Chem Agent Early Warning Using Chem Agent Alarm

Perform Refueling Activities

Perform Rearming Activities

Execute a Hasty Attack

Perform Surveillance (Visual and Electronic) Activities

Move in a Built-Up Area

Establish a Platoon Hot Loop

Recover by Similar Vehicle

Break Contact from the Enemy

Engage Targets Using the Two Tank Method

Occupy a Battle Position in a Built-Up Area

Execute Actions on Contact

Perform Voice Radio Activities

Execute Actions at a Halt

Perform a Tactical Road March

Execute Traveling Overwatch

Execute Traveling

Execute Bounding Overwatch

Defend Against Air Attack

Perform Consolidation and Reorganization Activities

Improve Battle Positions

Prepare Subsequent Battle Positions

Occupy Battle Positions

Displace to Subsequent Battle Position

Establish Wire Communications

Assault an Enemy Position

Establish All-Round Security

Camouflage Vehicles and Equipment

Perform Intelligence Gathering Activities

React to Indirect Fire

Prepare for a Friendly Nuclear Strike

Employ Physical Security Measures

Employ Electronic Counter Countermeasures

Perform Rupture Force Activities

Perform Reserve Force Activities

Perform Rear Guard Activities

Perform Breaching Force Activities

Perform Assault Force Activities

Perform Support Force Activities

Perform Landing Zone Activities

Move Using a Column Formation

Move Using a Combat Wedge Formation

Move Using a Line Formation

Perform Actions at a Defile

Employ Signal Security Measures

Take Countersurveillance Measures

Perform Reconnaissance within a Battle Position

Perform Movement Security Using Smoke Systems

Perform Stand-To Activities

Perform Actions Before an NBC Attack

Perform Actions During an NBC Attack

Perform Actions After an NBC Attack

Perform Actions When Operating in Areas of Residual Rad

APPENDIX B: TRAINING EFFECTIVENESS RATING QUESTIONNAIRE.

TRAINING EFFECTIVENESS RATING QUESTIONNAIRE

NOTE: Your comments on this questionnaire are very important. Please complete the last page of the questionnaire when you have completed all the pairwise comparisons.

I. INTRODUCTION. This questionnaire is designed to obtain your judgment concerning the *effectiveness of four* training alternatives with respect to a particular task under consideration. Each training alternative will be compared against each other for its contribution to one of six training effectiveness evaluation criteria (this process is called pairwise comparison). The contribution scores you establish will then be entered into a computer program called TOPSIS (Technique for Order Preference by Similarity to the Ideal Solution). This program will compute your ranking of the four alternatives for each of the eight tasks under evaluation.

II. THE TRAINING EFFECTIVENESS CRITERIA. Before you establish contribution scores for each of the training alternatives with respect to the training effectiveness criteria, let me first explain the six criteria. The criteria are: stimuli presentation, response presentation, feedback presentation, task commonality, physical similarity, and training time. These criteria are explained below.

Stimuli presentation (C1) is an evaluation criteria used to judge the potential the four alternatives have to present information for the particular task under consideration. Based upon your knowledge of the gunner's station of the Future Armored Combat System and your knowledge of predecessor systems, determine what type of stimuli is required to perform the task under consideration. The types of stimuli are visual cues, audio cues, tactical (sense of touch) cues, external stimulus motion cues, internal stimulus motion cues, olfactile (sense of smell) cues, and gustatile (sense of taste) cues. The analyst then judges the extent to which a particular training alternative can provide the required stimuli to perform the task.

The response presentation criteria (C2) is used to evaluate the extent to which the training alternatives permit a response to the information presented to the trainee or crewmember for the particular task under review. In this case, first determine what type of response is required of the operator to perform the task

under consideration. This response can take one of the following forms: verbal; written; manipulative act; tracking; or procedural performance. Then judge the extent to which a particular training alternative can accept that type of response.

The feedback presentation criteria (C3) is used to evaluate the extent to which the training alternatives can provide feedback to the operator. Again, first determine the type of feedback required to reinforce correct performance or correct faulty performance on a particular task. This determination is made based upon your knowledge of: the gunner's station of the Future Armored Combat System; the gunner's station of predecessor systems; and the four training alternatives. Feedback presentation takes one of the following forms: visual; aural; written; face-to-face communication; indirect communication; tactile (sense of touch); kinesthetic (sense of motion); olfactile (sense of smell); and gustatile (sense of taste). Then judge the extent to which a particular training alternative can provide the required feedback.

The task commonality criteria (C4) is used to evaluate the extent to which the training alternatives can train the subtasks (basic steps) of a particular task. The subtasks of a particular task are either provided to you or you make an estimate of what the subtasks might be based upon your knowledge of the developing system and its predecessor systems (you will estimate for this questionnaire). Then estimate the percentage of subtasks a particular training alternative would be able to train so that you can make a comparison judgmentbetween the alternatives.

The physical similarity criteria (C5) is used to evaluate the extent to which the representation of the displays and controls of the four training alternatives are similar to the displays and controls of the Future Armored Combat System for a particular task under consideration. Since little is known of the developing system at this early stage of its developmental cycle you must determine if the particular training alternative has the potential to provide display and control physical (includes fidelity) similarity to what will likely be found in the gunner's station of the Future Armored Combat System.

The final criteria used to evaluate the effectiveness of a training alternative for a particular task is training time (C6). This criteria is used to evaluate the length of training time required to train a particular task using one of the four training alternatives. It is not measured in absolute time (something a later field test would establish) but rather reflects a comparison among alternatives.

III. THE RELATIVE IMPORTANCE OF THE SIX CRITERIA. Now we must establish the degree to which each criteria contributes to the goal of selecting the most effective training alternative for the task under consideration. This establishes what is called the decision maker's weights (you are the decision maker in this case). For example, if you believe that task commonality is twice as important as training time then the comparison ratings you assign for task commonality should receive twice the credit in the rating process. To obtain these weights you will compare each criteria with another criteria using the rating scale below:

THE PAIRWISE COMPARISON SCALE

Intensity of Importance	Definition	Explanation
1	Equal importance of both elements	Two elements contribute equally to training effectiveness
3	Weak importance of one element over the other	Experience and judgement slightly favor one criteria over the other
5	Essential or strong importance of one element over the other	Experience and judgement strongly favor one criteria over the other
7	Demonstrated importance of one element over the other	A criteria is strongly favored and its dominance is demonstrated in practice
9	Absolute importance of one element over the other	The evidence favoring one criteria over another is of the highest possible order of affirmation
2,4,	Intermediate values	Compromise is needed

6,8	between two adjacent judgements	between two judgements

Reciprocals

If the second item of comparison is the stronger contributor to training effectiveness then the score given in the comparison rating is the reciprocal value of the appropriate rating in the scale above (e.g. 1/3,1/5,1/6).

Here is an example of how to use this scale. The first comparison to make is to establish the contribution stimuli presentation makes to training effectiveness when compared to response presentation. Let us say you decide that the ability of any training alternative to present information (stimuli presentation) is strongly more important to the goal of achieving an effective training system than the ability of any training alternative to permit a trainee response to information (response presentation). The rating scale rates a 'strongly more important (strongly favor)' comparison a 5. Therefore, you would rate the stimuli presentation versus response presentation a 5. Note: The order of comparison is important. For example, if you feel that response presentation is strongly more important than stimuli presentation you would rate the stimuli presentation versus response presentation its reciprocal value or 1/5.

Now, please answer the following questions using the 1 to 9 rating scale (or reciprocal value).

1. To what degree does stimuli presentation contribute to training effectiveness when compared to response presentation?

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2. To what degree does stimuli presentation contribute to training effectiveness when compared to feedback presentation?

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3. To what degree does stimuli presentation contribute to training effectiveness when compared to task commonality?

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4. To what degree does stimuli presentation contribute to training effectiveness when compared to physical similarity?

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5. To what degree does stimuli presentation contribute to training effectiveness when compared to training time?

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6. To what degree does response presentation contribute to training effectiveness when compared to feedback presentation?

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7. To what degree does response presentation contribute to training effectiveness when compared to task commonality?

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8. To what degree does response presentation contribute to training effectiveness when compared to physical similarity?

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9. To what degree does response presentation contribute to training effectiveness when compared to training time?

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10. To what degree does feedback presentation contribute to training effectiveness when compared to task commonality?

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11. To what degree does feedback presentation contribute to training effectiveness when compared to physical similarity?

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12. To what degree does feedback presentation contribute to training effectiveness when compared to training time?

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13. To what degree does task commonality contribute to training effectiveness when compared to physical similarity?

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14. To what degree does task commonality contribute to training effectiveness when compared to training time?

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15. To what degree does physical similarity contribute to training effectiveness when compared to training time?

IV. TRAINING ALTERNATIVES. Now that we have established your ranking of the six criteria with respect to their contribution to training effectiveness it is time to introduce the four training alternatives. The four training alternatives are: classroom or unit instructor based instruction, part task computer based instruction, full function stand alone trainers, amd embedded training.

Classroom or unit instructor based instruction (A1) is the traditional training given by an instructor. Both small group instruction (anywhere from 1:6 to 1:16 instructor to student ratio) and large group instruction (1:17 to 1:60 instructor to student ratio) are included in

this category. Instructors provide instruction through traditional audio-visual means. This includes blackboards, overhead projectors, 35mm slide projectors, films, video tapes, guest speakers and panel discussions. Student performance evaluation ranges from instructor subjective opinion of classroom contribution through practical exercises to graded individual papers and written or hands on (hands on the actual piece of equipment) performance examinations.

Part task, computer based instruction (A2) ranges from instruction provided by a table top personal computer through a learning station linked to a mainframe computer to a table top computer based delivery system specifically designed for training. This latter subcategory includes systems such as the Electronic Information Delivery System (which provides enhanced learning through a touch screen display vice a pure keyboard operation) and the Video Disc Gunnery Simulator (a table top videodisc based trainer designed to familiarize a tank gunner with the fire control equipment at his crew station and train the tasks engage the target with the main gun /coax machinegun from the gunner's station under varing combat conditions). Instructors or facilitators are present for the instruction but only provide answers to specific student questions on lesson content, operation of the computer providing the instruction, or direct movement to the next training step (when the computer cannot perform this function). This category can include collective trainers whose function is to train partial task groupings or parts of individual tasks without fully replicating the actual piece of equipment or crewmember station. A good example of this is the Combined Arms Tactical Trainer (often referred to as Simulation Networking - SIMNET). This trainer trains crews in collective gunnery and tactical tasks by providing only the required fidelity necessary to train the tasks chosen for training.

Full function stand alone trainers (A3) are designed to replicate performance on a task in the same way as it is performed on the operational equipment. They are also designed to replicate the physical environment of the crewmember's station (knobs, controls, switches, seats, legroom, etc.). Good examples of these type of trainers are flight simulators for helicopters and fixed wing aircraft and the Unit Conduct of Fire Trainer (UCOFT) for the tank or Bradley Fighting Vehicle (BFV). The UCOFT replicates the physical characteristics of the vehicle commander and gunner positions and uses a computer driven matrix of 685 increasingly difficult exercises to train

vehicle commander and gunner teams on target engagement techniques. These stand alone trainers are frequently quite similar to their embedded training counterparts with one noteable exception. It is usually not possible to replicate the conditions of weather which would affect human performance on a task. For example, flight simulators and the UCOFT are enclosed in environmentally controlled rooms or shelters, so the temperature and humididty which may effect a tank crew's performance on a task outdoors is not replicated in the simulator. These full funtion stand alone trainers often have limited accessibility since they would not be produced in the same quantities as would the operational equipment (a function of cost). Instructors or operators are present for the training but facilitate the students progress through the training software rather than provide the training themselves. These trainers would either provide their own performance evaluation and feedback or would be supplemented by an instructor or operator to provide any additional required evaluation or feedback on task performance.

Embedded training (A4) is the fourth alternative. Embedded training is training that is provided by capabilities designed to be built into or added onto operational systems to enhance and maintain the skill proficiency necessary to operate and maintain that equipment end item (U.S. Army Policy Letter, 3 March 1987). Embedded training subsystems lie on a continuum ranging from an appended training subsystem to subsystems totally integrated with the operational equipment. Appended subsystems can be quickly attached to existing mounting hardware and data or electronic connections. At the mid-point are training subsystems which are permanently mounted to the combat system but are an adjunct to the operational hardware. On the opposite end of this continuum are training subsystems which are totally integrated into the operational hardware (i.e., subsystems which share the same black box). Embedded training must provide, in some fashion, performance assessment to determine the proficiency level of the user, feedback to the user to improve performance or reinforce correct performance, and record keeping to manage the training proficiency progression of the user. Instructors or facilitators can be present for the task training provided by an embedded training capability but do not present the training. They perform the same role as in alternatives two and three. Feedback may be provided by the embedded training capability itself or by an instructor or facilitator designated to observe the training.

V. TASK RATINGS.

A. PERFORM BEFORE OPERATIONS CHECKS AND SERVICES. This is the first task for which you will establish comparison ratings. Answer the following questions keeping in mind what you know about the requirements of the M1A1 Abrams tank and the proposed capabilites and characteristics of the Future Armored Combat System with respect to this particular task. This step evaluates the potential each training alternative has in training the perform before operations checks and services task for each of the six measures of training effectiveness (criteria) we have established. Note: Use the previous rating scale except in this case we are comparing the training alternatives just discussed instead of the effectiveness criteria. Please answer the following questions.

STIMULI PRESENTATION.

1. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task perform before operations checks and services when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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2. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task perform before operations checks and services when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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3. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task perform before operations checks and services when compared to embedded training (A4)? [1-9,1/2-1/9]

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4. To what degree or level of potential does part task computer based instruction (A2) have to present information required to train the task perform before operations checks and services when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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5. To what degree or level of potential does part task computer based instruction (A2) have to present information required to train the task perform before operations checks and services when compared to embedded training (A4)? [1-9,1/2-1/9]

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6. To what degree or level of potential does full function stand alone trainers (A3) have to present information required to train the task perform before operations checks and services when compared to embedded training (A4)? [1-9,1/2-1/9]

RESPONSE PRESENTATION

7. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task perform before operations checks and services when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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8. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task perform before operations checks and services when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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9. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task perform before operations checks and services when compared to embedded training (A4)? [1-9,1/2-1/9]

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10. To what degree or level of potential does part task computer based instruction (A2) have to permit the trainee to respond to information presented to train the task perform before operations checks and services when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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11. To what degree or level of potential does part task computer based instruction (A2) have to permit the trainee to respond to information presented to train the task perform before operations checks and services when compared to embedded training (A4)? [1-9,1/2-1/9]

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12. To what degree or level of potential do full function stand alone trainers (A3) have to permit the trainee to respond to information presented to train the task perform before operations checks and services when compared to embedded training (A4)? [1-9,1/2-1/9]

FEEDBACK PRESENTATION

13. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task perform before operations checks and services when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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14. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task perform before operations checks and services when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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15. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task perform before operations checks and services when compared to embedded training (A4)? [1-9,1/2-1/9]

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16. To what degree or level of potential does part task computer based instruction (A2) have to provide feedback required to train the task perform before operations checks and services when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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17. To what degree or level of potential does part task computer based instruction (A2) have to provide feedback required to train the task perform before operations checks and services when compared to embedded training (A4)? [1-9,1/2-1/9]

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18. To what degree or level of potential do full function stand alone trainers (A3) have to provide feedback required to train the task perform before operations checks and services when compared to embedded training (A4)? [1-9,1/2-1/9]

TASK COMMONALITY.

19. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task perform before operations checks and services when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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20. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task perform before operations checks and services when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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21. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task perform before operations checks and services when compared to embedded training (A4)? [1-9,1/2-1/9]

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22. To what degree or level of potential does part task computer based instruction (A2) have to cover each of the subtasks (basic steps) required to train the task perform before operations checks and services when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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23. To what degree or level of potential does part task computer based instruction (A2) have to cover each of the subtasks (basic steps) required to train the task perform before operations checks and services when compared to embedded training (A4)? [1-9,1/2-1/9]

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24. To what degree or level of potential do full function stand alone trainers (A3) have to cover each of the subtasks (basic steps) required to train the task perform before operations checks and services when compared to embedded training (A4)? [1-9,1/2-1/9]

PHYSICAL SIMILARITY.

25. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necessary to train the task perform before operations checks and services when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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26. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide a physically similar displays, controls, or equipment necessary to train the task perform before operations checks and services when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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27. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide a physically similar displays, controls, or equipment necessary to train the task perform before operations checks and services when compared to embedded training (A4)? [1-9,1/2-1/9]

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28. To what degree or level of potential does part task computer based instruction (A2) have to provide a physically similar displays, controls, or equipment necessary to train the task perform before operations checks and services when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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29. To what degree or level of potential does part task computer based instruction (A2) have to provide a physically similar displays, controls, or equipment necessary to train the task perform before operations checks and services when compared to embedded training (A4)? [1-9,1/2-1/9]

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30. To what degree or level of potential do full function stand alone trainers (A3) have to provide a physically similar displays, controls, or equipment necessary to train the task perform before operations checks and services when compared to embedded training (A4)? [1-9,1/2-1/9]

TRAINING TIME.

31. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task perform before operations checks and services when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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32. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task perform before operations checks and services when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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33. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task perform before operations checks and services when compared to embedded training (A4)? [1-9,1/2-1/9]

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34. To what degree or level of potential does part task computer based instruction (A2) require less training time to train the task perform before operations checks and services when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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35. To what degree or level of potential does part task computer based instruction (A2) require less training time to train the task perform before operations checks and services when compared to embedded training (A4)? [1-9,1/2-1/9]

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36. To what degree or level of potential do full function stand alone trainers (A3) require less training time to train the task perform before operations checks and services when compared to embedded training (A4)? [1-9,1/2-1/9]

B. TROUBLESHOOT THE FIRE CONTROL SYSTEM.

STIMULI PRESENTATION.

1. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task troubleshoot the fire control system when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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2. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task troubleshoot the fire control system when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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3. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task troubleshoot the fire control system when compared to embedded training (A4)? [1-9,1/2-1/9]

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4. To what degree or level of potential does part task computer based instruction (A2) have to present information required to train the task troubleshoot the fire control system when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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5. To what degree or level of potential does part task computer based instruction (A2) have to present information required to train the task troubleshoot the fire control system when compared to embedded training (A4)? [1-9,1/2-1/9]

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6. To what degree or level of potential does full function stand alone trainers (A3) have to present information required to train the task troubleshoot the fire control system when compared to embedded training (A4)? [1-9,1/2-1/9]

RESPONSE PRESENTATION

7. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task troubleshoot the fire control system when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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8. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train

the task troubleshoot the fire control system when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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9. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task troubleshoot the fire control system when compared to embedded training (A4)? [1-9,1/2-1/9]

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10. To what degree or level of potential does part task computer based instruction (A2) have to permit the trainee to respond to information presented to train the task troubleshoot the fire control system when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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11. To what degree or level of potential does part task computer based instruction (A2) have to permit the trainee to respond to information presented to train the task troubleshoot the fire control system when compared to embedded training (A4)? [1-9,1/2-1/9]

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12. To what degree or level of potential do full function stand alone trainers (A3) have to permit the trainee to respond to information presented to train the task troubleshoot the fire control system when compared to embedded training (A4)? [1-9,1/2-1/9]

FEEDBACK PRESENTATION

13. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task troubleshoot the fire control system when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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14. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task troubleshoot the fire control system when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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15. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task troubleshoot the fire control system when compared to embedded training (A4)? [1-9,1/2-1/9]

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16. To what degree or level of potential does part task computer based instruction (A2) have to provide feedback required to train the task troubleshoot the fire control system when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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17. To what degree or level of potential does part task computer based instruction (A2) have to provide feedback required to train the task troubleshoot the fire control system when compared to embedded training (A4)? [1-9,1/2-1/9]

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18. To what degree or level of potential do full function stand alone trainers (A3) have to provide feedback required to train the task troubleshoot the fire control system when compared to embedded training (A4)? [1-9,1/2-1/9]

TASK COMMONALITY.

19. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task troubleshoot the fire control system when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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20. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task troubleshoot the fire control system when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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21. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task troubleshoot the fire control system when compared to embedded training (A4)? [1-9,1/2-1/9]

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22. To what degree or level of potential does part task computer based instruction (A2) have to cover each of the subtasks (basic steps) required to train the task troubleshoot the fire control system when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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23. To what degree or level of potential does part task computer based instruction (A2) have to cover each of the subtasks (basic steps) required to train the task troubleshoot the fire control system when compared to embedded training (A4)? [1-9,1/2-1/9]

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24. To what degree or level of potential do full function stand alone trainers (A3) have to cover each of the subtasks (basic steps) required to train the task troubleshoot the fire control system when compared to embedded training (A4)? [1-9,1/2-1/9]

PHYSICAL SIMILARITY.

25. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necessary to train the task troubleshoot the fire control system when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

----

26. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necessary to train the task troubleshoot the fire control system when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

----

27. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necessary to train the task troubleshoot the fire control system when compared to embedded training (A4)? [1-9,1/2-1/9]

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28. To what degree or level of potential does part task computer based instruction (A2) have to provide physically similar displays, controls, or equipment necessary to train the task troubleshoot the fire control system when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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29. To what degree or level of potential does part task computer based instruction (A2) have to provide physically similar displays, controls, or equipment necessary to train the task troubleshoot the fire control system when compared to embedded training (A4)? [1-9,1/2-1/9]

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30. To what degree or level of potential do full function stand alone trainers (A3) have to provide physically similar displays, controls, or equipment necessary to train the task troubleshoot the fire control system when compared to embedded training (A4)? [1-9,1/2-1/9]

TRAINING TIME.

31. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task troubleshoot the fire control system when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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32. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task troubleshoot the fire control system when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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33. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task troubleshoot the fire control system when compared to embedded training (A4)? [1-9,1/2-1/9]

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34. To what degree or level of potential does part task computer based instruction (A2) require less training time to train the task troubleshoot the fire control system when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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35. To what degree or level of potential does part task computer based instruction (A2) require less training time to train the task troubleshoot the fire control system when compared to embedded training (A4)? [1-9,1/2-1/9]

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36. To what degree or level of potential do full function stand alone trainers (A3) require less training time to train the task troubleshoot the fire control system when compared to embedded training (A4)? [1-9,1/2-1/9]

C. EVACUATE A WOUNDED CREWMAN.

STIMULI PRESENTATION.

1. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task evacuate a wounded crewman when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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2. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task evacuate a wounded crewman when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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3. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task evacuate a wounded crewman when compared to embedded training (A4)? [1-9,1/2-1/9]

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4. To what degree or level of potential does part task computer based instruction (A2) have to present information required to train the task evacuate a wounded crewman when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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5. To what degree or level of potential does part task computer based instruction (A2) have to present information required to train the task evacuate a wounded crewman when compared to embedded training (A4)? [1-9,1/2-1/9]

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6. To what degree or level of potential does full function stand alone trainers (A3) have to present information required to train the task evacuate a wounded crewman when compared to embedded training (A4)? [1-9,1/2-1/9]

RESPONSE PRESENTATION

7. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task evacuate a wounded crewman when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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8. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task evacuate a wounded crewman when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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9. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task evacuate a wounded crewman when compared to embedded training (A4)? [1-9,1/2-1/9]

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10. To what degree or level of potential does part task computer based instruction (A2) have to permit the trainee to respond to information presented to train the task evacuate a wounded crewman when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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11. To what degree or level of potential does part task computer based instruction (A2) have to permit the trainee to respond to information presented to train the task evacuate a wounded crewman when compared to embedded training (A4)? [1-9,1/2-1/9]

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12. To what degree or level of potential do full function stand alone trainers (A3) have to permit the trainee to respond to information presented to train the task evacuate a wounded crewman when compared to embedded training (A4)? [1-9,1/2-1/9]

FEEDBACK PRESENTATION

13. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task evacuate a wounded crewman when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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14. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task evacuate a wounded crewman when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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15. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task evacuate a wounded crewman when compared to embedded training (A4)? [1-9,1/2-1/9]

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16. To what degree or level of potential does part task computer based instruction (A2) have to provide feedback required to train the task evacuate a wounded crewman when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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17. To what degree or level of potential does part task computer based instruction (A2) have to provide feedback required to train the task evacuate a wounded crewman when compared to embedded training (A4)? [1-9,1/2-1/9]

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18. To what degree or level of potential do full function stand alone trainers (A3) have to provide feedback required to train the task evacuate a wounded crewman when compared to embedded training (A4)? [1-9,1/2-1/9]

TASK COMMONALITY.

19. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task evacuate a wounded crewman when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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20. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task evacuate a wounded crewman when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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21. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task evacuate a wounded crewman when compared to embedded training (A4)? [1-9,1/2-1/9]

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22. To what degree or level of potential does part task computer based instruction (A2) have to cover each of the subtasks (basic steps) required to train the task evacuate a wounded crewman when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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23. To what degree or level of potential does part task computer based instruction (A2) have to cover each of the subtasks (basic steps) required to train the task evacuate a wounded crewman when compared to embedded training (A4)? [1-9,1/2-1/9]

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24. To what degree or level of potential do full function stand alone trainers (A3) have to cover each of the subtasks (basic steps) required to train the task evacuate a wounded crewman when compared to embedded training (A4)? [1-9,1/2-1/9]

PHYSICAL SIMILARITY.

25. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necessary to train the task evacuate a wounded crewman when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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26. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or

equipment necessary to train the task evacuate a wounded crewman when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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27. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necessary to train the task evacuate a wounded crewman when compared to embedded training (A4)? [1-9,1/2-1/9]

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28. To what degree or level of potential does part task computer based instruction (A2) have to provide physically similar displays, controls, or equipment necessary to train the task evacuate a wounded crewman when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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29. To what degree or level of potential does part task computer based instruction (A2) have to provide physically similar displays, controls, or equipment necessary to train the task evacuate a wounded crewman when compared to embedded training (A4)? [1-9,1/2-1/9]

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30. To what degree or level of potential do full function stand alone trainers (A3) have to provide physically similar displays, controls, or equipment necessary to train the task evacuate a wounded crewman when compared to embedded training (A4)? [1-9,1/2-1/9]

TRAINING TIME.

31. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task evacuate a wounded crewman when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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32. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task evacuate a wounded crewman when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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33. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task evacuate a wounded crewman when compared to embedded training (A4)? [1-9,1/2-1/9]

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34. To what degree or level of potential does part task computer based instruction (A2) require less training time to train the task evacuate a wounded crewman when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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35. To what degree or level of potential does part task computer based instruction (A2) require less training time to train the task evacuate a wounded crewman when compared to embedded training (A4)? [1-9,1/2-1/9]

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36. To what degree or level of potential do full function stand alone trainers (A3) require less training time to train the task evacuate a wounded crewman when compared to embedded training (A4)? [1-9,1/2-1/9]

D. REPLACE A THROWN TRACK.

STIMULI PRESENTATION.

1. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task replace a thrown track when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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2. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task replace a thrown track when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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3. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task replace a thrown track when compared to embedded training (A4)? [1-9,1/2-1/9]

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4. To what degree or level of potential does part task computer based instruction (A2) have to present information required to train the task replace a thrown track when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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5. To what degree or level of potential does part task computer based instruction (A2) have to present information required to train the task replace a thrown track when compared to embedded training (A4)? [1-9,1/2-1/9]

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6. To what degree or level of potential does full function stand alone trainers (A3) have to present information required to train the task replace a thrown track when compared to embedded training (A4)? [1-9,1/2-1/9]

RESPONSE PRESENTATION

7. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task replace a thrown track when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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8. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task replace a thrown track when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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9. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task replace a thrown track when compared to embedded training (A4)? [1-9,1/2-1/9]

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10. To what degree or level of potential does part task computer based instruction (A2) have to permit the trainee to respond to information presented to train the task replace a thrown track when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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11. To what degree or level of potential does part task computer based instruction (A2) have to permit the trainee to respond to information presented to train the task replace a thrown track when compared to embedded training (A4)? [1-9,1/2-1/9]

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12. To what degree or level of potential do full function stand alone trainers (A3) have to permit the trainee to respond to information presented to train the task replace a thrown track when compared to embedded training (A4)? [1-9,1/2-1/9]

FEEDBACK PRESENTATION

13. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task replace a thrown track when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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14. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task replace a thrown track when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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15. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task replace a thrown track when compared to embedded training (A4)? [1-9,1/2-1/9]

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16. To what degree or level of potential does part task computer based instruction (A2) have to provide feedback required to train the task replace a thrown track when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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17. To what degree or level of potential does part task computer based instruction (A2) have to provide feedback required to train the task replace a thrown track when compared to embedded training (A4)? [1-9,1/2-1/9]

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18. To what degree or level of potential do full function stand alone trainers (A3) have to provide feedback required to train the task replace a thrown track when compared to embedded training (A4)? [1-9,1/2-1/9]

TASK COMMONALITY.

19. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task replace a thrown track when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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20. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task replace a thrown track when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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21. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task replace a thrown track when compared to embedded training (A4)? [1-9,1/2-1/9]

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22. To what degree or level of potential does part task computer based instruction (A2) have to cover each of the subtasks (basic steps) required to train the task replace a thrown track when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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23. To what degree or level of potential does part task computer based instruction (A2) have to cover each of the subtasks (basic steps) required to train the task replace a thrown track when compared to embedded training (A4)? [1-9,1/2-1/9]

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24. To what degree or level of potential do full function stand alone trainers (A3) have to cover each of the subtasks (basic steps) required to train the task replace a thrown track when compared to embedded training (A4)? [1-9,1/2-1/9]

PHYSICAL SIMILARITY.

25. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necessary to train the task replace a thrown track when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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26. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necessary to train the task replace a thrown track when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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27. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necessary to train the task replace a thrown track when compared to embedded training (A4)? [1-9,1/2-1/9]

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28. To what degree or level of potential does part task computer based instruction (A2) have to provide physically similar displays, controls, or equipment necessary to train the task replace a thrown track when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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29. To what degree or level of potential does part task computer based instruction (A2) have to provide physically similar displays, controls, or equipment necessary to train the task replace a thrown track when compared to embedded training (A4)? [1-9,1/2-1/9]

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30. To what degree or level of potential do full function stand alone trainers (A3) have to provide physically similar displays, controls, or equipment necessary to train the task replace a thrown track when compared to embedded training (A4)? [1-9,1/2-1/9]

TRAINING TIME.

31. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task replace a thrown track when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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32. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task replace a thrown track when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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33. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task replace a thrown track when compared to embedded training (A4)? [1-9,1/2-1/9]

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34. To what degree or level of potential does part task computer based instruction (A2) require less training time to train the task replace a thrown track when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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35. To what degree or level of potential does part task computer based instruction (A2) require less training time to train the task replace a thrown track when compared to embedded training (A4)? [1-9,1/2-1/9]

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36. To what degree or level of potential do full function stand alone trainers (A3) require less training time to train the task replace a thrown track when compared to embedded training (A4)? [1-9,1/2-1/9]

E. ENGAGE TARGETS WITH THE MAIN GUN FROM THE GUNNER'S STATION.

STIMULI PRESENTATION.

1. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task engage targets with the main gun from the gunner's station when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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2. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task engage targets with the main gun from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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3. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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4. To what degree or level of potential does part task computer based instruction (A2) have to present information required to train the task engage targets with the main gun from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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5. To what degree or level of potential does part task computer based instruction (A2) have to present information required to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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6. To what degree or level of potential does full function stand alone trainers (A3) have to present information required to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

RESPONSE PRESENTATION

7. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task engage targets with the main gun from the gunner's station when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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8. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task engage targets with the main gun from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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9. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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10. To what degree or level of potential does part task computer based instruction (A2) have to permit the trainee to respond to information presented to train the task engage targets with the main gun from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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11. To what degree or level of potential does part task computer based instruction (A2) have to permit the trainee to respond to information presented to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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12. To what degree or level of potential do full function stand alone trainers (A3) have to permit the trainee to respond to information presented to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

FEEDBACK PRESENTATION

13. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task engage targets with the main gun from the gunner's station when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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14. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task engage targets with the main gun from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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15. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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16. To what degree or level of potential does part task computer based instruction (A2) have to provide feedback required to train the task engage targets with the main gun from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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17. To what degree or level of potential does part task computer based instruction (A2) have to provide feedback required to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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18. To what degree or level of potential do full function stand alone trainers (A3) have to provide feedback required to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4,? [1-9,1/2-1/9]

TASK COMMONALITY.

19. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task engage targets with the main gun from the gunner's station when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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20. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task engage targets with the main gun from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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21. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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22. To what degree or level of potential does part task computer based instruction (A2) have to cover each of the subtasks (basic steps) required to train the task engage targets with the main gun from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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23. To what degree or level of potential does part task computer based instruction (A2) have to cover each of the subtasks (basic steps) required to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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24. To what degree or level of potential do full function stand alone trainers (A3) have to cover each of the subtasks (basic steps) required to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

PHYSICAL SIMILARITY.

25. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necessary to train the task engage targets with the main gun from the gunner's station when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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26. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necessary to train the task engage targets with the main gun from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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27. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necessary to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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28. To what degree or level of potential does part task computer based instruction (A2) have to provide physically similar displays, controls, or equipment necessary to train the task engage targets with the main gun from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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29. To what degree or level of potential does part task computer based instruction (A2) have to provide physically similar displays, controls, or equipment necessary to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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30. To what degree or level of potential do full function stand alone trainers (A3) have to provide physically similar displays, controls, or equipment necessary to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

TRAINING TIME.

31. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task engage targets with the main gun from the gunner's station when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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32. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task engage targets with the main gun from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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33. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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34. To what degree or level of potential does part task computer based instruction (A2) require less training time to train the task engage targets with the main gun from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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35. To what degree or level of potential does part task computer based instruction (A2) require less training time to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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36. To what degree or level of potential do full function stand alone trainers (A3) require less training time to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

F. ADJUST CREW COMPARTMENT PRESSURIZATION.

STIMULI PRESENTATION.

1. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task adjust crew compartment pressurization when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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2. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task adjust crew compartment pressurization when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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3. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task adjust crew compartment pressurization when compared to embedded training (A4)? [1-9,1/2-1/9]

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4. To what degree or level of potential does part task computer based instruction (A2) have to present information required to train the task adjust crew compartment pressurization when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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5. To what degree or level of potential does part task computer based instruction (A2) have to present information required to train the task adjust crew compartment pressurization when compared to embedded training (A4)? [1-9,1/2-1/9]

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6. To what degree or level of potential does full function stand alone trainers (A3) have to present information required to train the task adjust crew compartment pressurization when compared to embedded training (A4)? [1-9,1/2-1/9]

RESPONSE PRESENTATION

7. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task adjust crew compartment pressurization when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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8. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task adjust crew compartment pressurization when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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9. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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10. To what degree or level of potential does part task computer based instruction (A2) have to permit the trainee to respond to information presented to train the task adjust crew compartment pressurization when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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11. To what degree or level of potential does part task computer based instruction (A2) have to permit the trainee to respond to information presented to train the task adjust crew compartment pressurization when compared to embedded training (A4)? [1-9,1/2-1/9]

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12. To what degree or level of potential do full function stand alone trainers (A3) have to permit the trainee to respond to information presented to train the task adjust crew compartment pressurization when compared to embedded training (A4)? [1-9,1/2-1/9]

FEEDBACK PRESENTATION

13. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task adjust crew compartment pressurization when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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14. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task adjust crew compartment pressurization when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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15. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task adjust crew compartment pressurization when compared to embedded training (A4)? [1-9,1/2-1/9]

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16. To what degree or level of potential does part task computer based instruction (A2) have to provide feedback required to train the task adjust crew compartment pressurization when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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17. To what degree or level of potential does part task computer based instruction (A2) have to provide feedback required to train the task adjust crew compartment pressurization when compared to embedded training (A4)? [1-9,1/2-1/9]

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18. To what degree or level of potential do full function stand alone trainers (A3) have to provide feedback required to train the task adjust crew compartment pressurization when compared to embedded training (A4)? [1-9,1/2-1/9]

TASK COMMONALITY.

19. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task adjust crew compartment pressurization when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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20. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task adjust crew compartment pressurization when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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21. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task adjust crew compartment pressurization when compared to embedded training (A4)? [1-9,1/2-1/9]

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22. To what degree or level of potential does part task computer based instruction (A2) have to cover each of the subtasks (basic steps) required to train the task adjust crew compartment pressurization when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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23. To what degree or level of potential does part task computer based instruction (A2) have to cover each of the subtasks (basic steps) required to train the task adjust crew compartment pressurization when compared to embedded training (A4)? [1-9,1/2-1/9]

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24. To what degree or level of potential do full function stand alone trainers (A3) have to cover each of the subtasks (basic steps) required to train the task adjust crew compartment pressurization when compared to embedded training (A4)? [1-9,1/2-1/9]

PHYSICAL SIMILARITY.

25. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necessary to train the task adjust crew compartment pressurization when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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26. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necessary to train the task adjust crew compartment pressurization when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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27. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necessary to train the task adjust crew compartment pressurization when compared to embedded training (A4)? [1-9,1/2-1/9]

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28. To what degree or level of potential does part task computer based instruction (A2) have to provide physically similar displays, controls, or equipment necessary to train the task adjust crew compartment pressurization when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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29. To what degree or level of potential does part task computer based instruction (A2) have to provide physically similar displays, controls, or equipment necessary to train the task adjust crew compartment pressurization when compared to embedded training (A4)? [1-9,1/2-1/9]

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30. To what degree or level of potential do full function stand alone trainers (A3) have to provide physically similar displays, controls, or equipment necessary to train the task adjust crew compartment pressurization when compared to embedded training (A4)? [1-9,1/2-1/9]

TRAINING TIME.

31. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task adjust crew compartment pressurization when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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32. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task adjust crew compartment pressurization when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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33. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task adjust crew compartment pressurization when compared to embedded training (A4)? [1-9,1/2-1/9]

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34. To what degree or level of potential does part task computer based instruction (A2) require less training time to train the task adjust crew compartment pressurization when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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35. To what degree or level of potential does part task computer based instruction (A2) require less training time to train the task adjust crew compartment pressurization when compared to embedded training (A4)? [1-9,1/2-1/9]

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36. To what degree or level of potential do full function stand alone trainers (A3) require less training time to train the task adjust crew compartment pressurization when compared to embedded training (A4)? [1-9,1/2-1/9]

G. ZERO THE MACHINEGUN

STIMULI PRESENTATION.

1. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task zero the machinegun when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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2. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task zero the machinegun when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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3. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task zero the machinegun when compared to embedded training (A4)? [1-9,1/2-1/9]

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4. To what degree or level of potential does part task computer based instruction (A2) have to present information required to train the task zero the machinegun when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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5. To what degree or level of potential does part task computer based instruction (A2) have to present information required to train the task zero the machinegun when compared to embedded training (A4)? [1-9,1/2-1/9]

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6. To what degree or level of potential does full function stand alone trainers (A3) have to present information required to train the task zero the machinegun when compared to embedded training (A4)? [1-9,1/2-1/9]

RESPONSE PRESENTATION

7. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train

the task zero the machinegun when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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8. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task zero the machinegun when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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9. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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10. To what degree or level of potential does part task computer based instruction (A2) have to permit the trainee to respond to information presented to train the task zero the machinegun when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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11. To what degree or level of potential does part task computer based instruction (A2) have to permit the trainee to respond to information presented to train the task zero the machinegun when compared to embedded training (A4)? [1-9,1/2-1/9]

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12. To what degree or level of potential do full function stand alone trainers (A3) have to permit the trainee to respond to information presented to train the task zero the machinegun when compared to embedded training (A4)? [1-9,1/2-1/9]

FEEDBACK PRESENTATION

13. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task zero the machinegun when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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14. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task zero the machinegun when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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15. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task zero the machinegun when compared to embedded training (A4)? [1-9,1/2-1/9]

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16. To what degree or level of potential does part task computer based instruction (A2) have to provide feedback required to train the task zero the machinegun when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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17. To what degree or level of potential does part task computer based instruction (A2) have to provide feedback required to train the task zero the machinegun when compared to embedded training (A4)? [1-9,1/2-1/9]

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18. To what degree or level of potential do full function stand alone trainers (A3) have to provide feedback required to train the task zero the machinegun when compared to embedded training (A4)? [1-9,1/2-1/9]

TASK COMMONALITY.

19. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task zero the machinegun when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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20. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task zero the machinegun when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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21. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task zero the machinegun when compared to embedded training (A4)? [1-9,1/2-1/9]

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22. To what degree or level of potential does part task computer based instruction (A2) have to cover each of the subtasks (basic steps) required to train the task zero the machinegun when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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23. To what degree or level of potential does part task computer based instruction (A2) have to cover each of the subtasks (basic steps) required to train the task zero the machinegun when compared to embedded training (A4)? [1-9,1/2-1/9]

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24. To what degree or level of potential do full function stand alone trainers (A3) have to cover each of the subtasks (basic steps) required to train the task zero the machinegun when compared to embedded training (A4)? [1-9,1/2-1/9]

PHYSICAL SIMILARITY.

25. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necessary to train the task zero the machinegun when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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26. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necessary to train the task zero the machinegun when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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27. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necessary to train the task zero the machinegun when compared to embedded training (A4)? [1-9,1/2-1/9]

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28. To what degree or level of potential does part task computer based instruction (A2) have to provide physically similar displays, controls, or equipment necessary to train the task zero the machinegun when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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29. To what degree or level of potential does part task computer based instruction (A2) have to provide physically similar displays, controls, or equipment necessary to train the task zero the machinegun when compared to embedded training (A4)? [1-9,1/2-1/9]

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30. To what degree or level of potential do full function stand alone trainers (A3) have to provide physically similar displays, controls, or equipment necessary to train the task zero the machinegun when compared to embedded training (A4)? [1-9,1/2-1/9]

TRAINING TIME.

31. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task zero the machinegun when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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32. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task zero the machinegun when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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33. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task zero the machinegun when compared to embedded training (A4)? [1-9,1/2-1/9]

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34. To what degree or level of potential does part task computer based instruction (A2) require less training time to train the task zero the machinegun when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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35. To what degree or level of potential does part task computer based instruction (A2) require less training time to train the task zero the machinegun when compared to embedded training (A4)? [1-9,1/2-1/9]

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36. To what degree or level of potential do full function stand alone trainers (A3) require less training time to train the task zero the machinegun when compared to embedded training (A4)? [1-9,1/2-1/9]

H. ENGAGE TARGETS WITH THE COAX FROM THE GUNNER'S STATION.

STIMULI PRESENTATION.

1. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task engage targets with the coax from the gunner's station when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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2. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task engage targets with the coax from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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3. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to present information required to train the task engage targets with the coax from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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4. To what degree or level of potential does part task computer based instruction (A2) have to present information required to train the task engage targets with the coax from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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5. To what degree or level of potential does part task computer based instruction (A2) have to present information required to train the task engage targets with the coax from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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6. To what degree or level of potential does full function stand alone trainers (A3) have to present information required to train the task engage targets with the coax from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

RESPONSE PRESENTATION

7. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task engage targets with the coax from the gunner's station when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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8. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task engage targets with the coax from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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9. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to permit the trainee to respond to information presented to train the task engage targets with the main gun from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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10. To what degree or level of potential does part task computer based instruction (A2) have to permit the trainee to respond to information presented to train the task engage targets with the coax from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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11. To what degree or level of potential does part task computer based instruction (A2) have to permit the trainee to respond to information presented to train the task engage targets with the coax from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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12. To what degree or level of potential do full function stand alone trainers (A3) have to permit the trainee to respond to information presented to train the task engage targets with the coax from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

FEEDBACK PRESENTATION

13. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task engage targets with the coax from the gunner's station when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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14. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task engage targets with the coax from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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15. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide feedback required to train the task engage targets with the coax from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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16. To what degree or level of potential does part task computer based instruction (A2) have to provide feedback required to train the task engage targets with the coax from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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17. To what degree or level of potential does part task computer based instruction (A2) have to provide feedback required to train the task engage targets with the coax from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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18. To what degree or level of potential do full function stand alone trainers (A3) have to provide feedback required to train the task engage targets with the coax from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

TASK COMMONALITY.

19. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task engage targets with the coax from the gunner's station when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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20. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task engage targets with the coax from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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21. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to cover each of the subtasks (basic steps) required to train the task engage targets with the coax from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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22. To what degree or level of potential does part task computer based instruction (A2) have to cover each of the subtasks (basic steps) required to train the task engage targets with the coax from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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23. To what degree or level of potential does part task computer based instruction (A2) have to cover each of the subtasks (basic steps) required to train the task engage targets with the coax from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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24. To what degree or level of potential do full function stand alone trainers (A3) have to cover each of the subtasks (basic steps) required to train the task engage targets with the coax from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

PHYSICAL SIMILARITY.

25. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necesstationry to train the task engage targets with the coax from the gunner's station when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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26. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necesstationry to train the task engage targets with the coax from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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27. To what degree or level of potential does unit or classroom instructor based instruction (A1) have to provide physically similar displays, controls, or equipment necesstationry to train the task engage targets with the coax from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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28. To what degree or level of potential does part task computer based instruction (A2) have to provide physically similar displays, controls, or equipment necesstationry to train the task engage targets with the coax from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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29. To what degree or level of potential does part task computer based instruction (A2) have to provide physically similar displays, controls, or equipment necesstationry to train the task engage targets with the coax from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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30. To what degree or level of potential do full function stand alone trainers (A3) have to provide physically similar displays, controls, or equipment necesstationry to train the task engage targets with the coax from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

TRAINING TIME.

31. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task engage targets with the coax from the gunner's station when compared to part task computer based instruction (A2)? [1-9,1/2-1/9]

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32. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task engage targets with the coax from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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33. To what degree or level of potential does unit or classroom instructor based instruction (A1) require less training time to train the task engage targets with the coax from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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34. To what degree or level of potential does part task computer based instruction (A2) require less training time to train the task engage targets with the coax from the gunner's station when compared to full function stand alone trainers (A3)? [1-9,1/2-1/9]

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35. To what degree or level of potential does part task computer based instruction (A2) require less training time to train the task engage targets with the coax from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

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36. To what degree or level of potential do full function stand alone trainers (A3) require less training time to train the task engage targets with the coax from the gunner's station when compared to embedded training (A4)? [1-9,1/2-1/9]

COMMENTS

Please include any comments in the space below. Comments might include the ease in understanding the questionnaire, how difficult it was to make judgements, any ideas on an alternate rating scale (perhaps something other than pairwise comparison), alternate rating criteria, and length of time it took you to complete the questionnaire.

APPENDIX C. TECHNIQUE FOR ORDER PREFERENCE BY SIMILARITY TO THE IDEAL SOLUTION (TOPSIS).

This appendix presents the six step generalized formulation of the multiattribute decisionmaking model TOPSIS used for the ordering of alternatives when cardinal preferences for the criteria (attributes) are available.[49] A simple example of the application of TOPSIS is also presented.

STEP 1. Develop a normalized decision matrix. This step is used to transform the various measurement dimensions of the criteria (speed, distance, weight, cost) into nondimensional (normalized) units so that comparisons across criteria can be made. This is accomplished by transforming the criterion value x_{ij} to a normalized value r_{ij} using vector normalization:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum^{m} x_{ij}^2}}, \quad \forall\, i,\; j = 1, \ldots, n$$

where m is the number of alternatives and n is the number of criteria

Step 2. Construct the weighted normalized decision matrix. The normalized decision matrix established in Step 1 is multiplied by a set of decisionmaker weights. These weights $w = (w_1, w_2, \ldots, w_j, \ldots, w_n)$ where $\sum_{j=1}^{n} w = 1$ can be obtained by the direct choice of the decisionmaker

or by several other techniques which assist the decisionmaker in establishing these weights. Some examples are: the eigenvector method, weighted least square method, entropy method and linear programming techniques for multidimensional analysis of preference (LINMAP).[50] The normalized decision matrix (R) multiplied by the weights (w) becomes the normalized decision matrix (V):

$$\begin{bmatrix} w_1 r_{11} & w_2 r_{12} & \cdots & w_j r_{1j} & \cdots & w_n r_{1n} \\ \vdots & \vdots & & \vdots & & \vdots \\ w_1 r_{i1} & w_2 r_{i2} & \cdots & w_j r_{ij} & \cdots & w_n r_{in} \\ \vdots & \vdots & & \vdots & & \vdots \\ w_1 r_{m1} & w_2 r_{m2} & \cdots & w_j r_{mj} & \cdots & w_n r_{mn} \end{bmatrix} = \begin{bmatrix} v_{11} & v_{12} & v_{1j} & v_{1n} \\ \vdots & \vdots & \vdots & \vdots \\ v_{i1} & v_{i2} & v_{ij} & v_{in} \\ \vdots & \vdots & \vdots & \vdots \\ v_{m1} & v_{m2} & v_{mj} & v_{mn} \end{bmatrix}$$

where m = the number alternatives and *n* = the number of the criteria.

Step 3. Establish the ideal and negative-ideal solutions. This step identifies the best and worst solutions by forming new alternatives (A^*, A^-) comprised of the highest and lowest criteria values associated with the alternatives under study. Remembering that v is an element of the weighted normalized decision matrix calculated in Step 2. The ideal solution is defined as:

$$A^* = \{\max_i v_{i1}, \max_i v_{i2}, \ldots, \max_i v_{in}\},$$

and the negative-ideal solution is defined as:

$$A^- = \{\min_i v_{i1}, \min_i v_{i2}, \ldots, \min_i v_{in}\}, \text{ where } i =$$

1,2,...,m alternatives and n = 1,2,...,n criteria.

Note: This definition is for benefit criteria. Cost criteria take the opposite solution definition.

Step 4. Calculate the separation measure. This step calculates the distance between each alternative and both the ideal and negative-ideal solutions. It is an Euclidean distance in n (number of criteria) dimensions. From the ideal solution this separation measure is:

$$s_{i*} = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^{*})^2}\ ,\ i = 1,\ 2,\ \ldots, m, \text{ and,}$$

from the negative-ideal solution the separation measure is:

$$s_{i-} = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^{-})^2}\ ,\ i = 1,\ 2,\ \ldots, m.$$

Step 5. Determine the relative closeness. This calculation establishes the c value or the relative closeness of a particular alternative to the ideal one. It is given by:

$$c_{i*} = s_{i-} / (s_{i*} + s_{i-}),\ 0 < c_{i*} < 1,\ i = 1,2,\ldots,m$$

If there are two alternatives with the same separation measure to the ideal solution (s_{i*}) then the alternative that is also the farthest from the negative-ideal solution (i.e. has the larger separation measure, s_{i-} will be selected.

Step 6. Rank the preference order. The alternatives are ranked first to last in the order of the largest to the smallest c value.

A short example will demonstrate the calculations involved in TOPSIS. Let us say we are trying to select a car among three alternatives (A1, A2, A3) and we decide that price, fuel economy, and top speed (x1,x2,x3) will be the criteria we use to judge the alternatives. Our sample data is:

$$D = \begin{array}{c} \\ A1 \\ A2 \\ A3 \end{array} \begin{array}{c} \begin{array}{ccc} x1 & x2 & x3 \end{array} \\ \begin{bmatrix} 30 & 15 & 125 \\ 20 & 24 & 110 \\ 10 & 29 & 95 \end{bmatrix} \end{array}$$

STEP 1. Develop a normalized decision matrix.

$$R = \begin{array}{c} \\ A1 \\ A2 \\ A3 \end{array} \begin{array}{c} \begin{array}{ccc} x1 & x2 & x3 \end{array} \\ \begin{bmatrix} .802 & .370 & .652 \\ .534 & .592 & .574 \\ .267 & .716 & .496 \end{bmatrix} \end{array}$$

where $r_{ij} = \dfrac{x_{ij}}{\sqrt{\sum_{i=1}^{3} x_{ij}^2}} = \dfrac{30}{\sqrt{(30)^2 + (20)^2 + (10)^2}} = \dfrac{30}{1400} = .802$

STEP 2. Construct the weighted normalized decision matrix. For our example, we assume that the relative importance of the criteria is w = (.4, .3, .3).

Therefore, V becomes:

$$V = \begin{array}{c} \\ A1 \\ A2 \\ A3 \end{array} \begin{array}{c} \begin{array}{ccc} x1 & x2 & x3 \end{array} \\ \begin{vmatrix} .802\ (.4) & .370\ (.3) & .652\ (.3) \\ .534\ (.4) & .592\ (.3) & .574\ (.3) \\ .267\ (.4) & .716\ (.3) & .496\ (.3) \end{vmatrix} \end{array}$$

$$V = \begin{array}{c} \\ A1 \\ A2 \\ A3 \end{array} \begin{array}{c} \begin{array}{ccc} x1 & x2 & x3 \end{array} \\ \begin{vmatrix} .321 & .111 & .196 \\ .214 & .178 & .172 \\ .107 & .215 & .149 \end{vmatrix} \end{array}$$

STEP 3. Establish the ideal and negative-ideal solutions.

The ideal solution contains the largest v in each column (except v_{i1} which is a cost criterion and takes the smallest value): $A^{*} = (.107, .215, .196)$.

The negative ideal solution contains the smallest v in each column (except v_{i1} which is a cost criterion and takes the largest value): $A^{-} = (.321, .111, .149)$.

STEP 4. Calculate the separation measure.

$$s_{i*} = \sqrt{\sum_{j=1}^{3} (v_{ij} - v_{j}^{*})^{2}}$$

$s_{1*} = [(.321 -.107) + (.111 -.215) + (.196 -.196)] = .238$

$s_{2*} = [(.214 -.107) + (.178 -.215) + (.172 -.196)] = .116$

$s_{3*} = [(.107 -.107) + (.215 -.215) + (.149 -.196)] = .047$

and

$$s_{i-} = \sqrt{\sum_{j=1}^{3} (v_{ij} - v_{j}^{-})^{2}}$$

$s_{1-} = [(.321 -.321) + (.111 -.111) + (.196 -.149)] = .051$

$s_{2-} = [(.214 -.321) + (.178 -.111) + (.172 -.149)] = .128$

$s_{3-} = [(.107 -.321) + (.215 -.111) + (.149 -.149)] = .238$

STEP 5. Determine the relative closeness.

$c_{1*} = s_{1-} / (s_{1*} + s_{1-}) = .051/(.238 + .051) = .176$

$c_{2*} = .128/(.116 + .128) = .525$

$c_{3*} = .238/(.047 + .238) = .835$

STEP 6. Rank the preference order.

The alternatives are ranked from step 5:

First: A3 (.835)

Second: A2 (.525)

Third: A1 (.176)

APPENDIX D: QUESTIONNAIRE DATA.

This appendix provides the questionnaire input data and eigenvector calculations for the level 3 (alternative versus criteria) weight determinations. Each page provides the six pairwise comparisons made for each subject matter expert for each task.

The input data is shown in matrix format. For example, the first matrix on page D - 3 reflects the following SME input for the stimuli presentation input for the first task:

Instructor Based Instr	:	Computer Based Instr	= 1/4
Instructor Based Instr	:	Stand Alone Trainers	= 1/7
Instructor Based Instr	:	Embedded Training	= 1/9
Computer Based Instr	:	Stand Alone Trainers	= 1/2
Computer Based Instr	:	Embedded Training	= 1/5
Stand Alone Trainers	:	Embedded Training	= 1

The entry for c provides the consistency index. For the matrix 1ASP (the first one next page) the consistency index is .037.

LEGEND

1ASP means:	3CTT means:
1 = SME # 1	3 = SME # 3
A = Task A	C = Task C
SP = Stimulus Presentation	TT = Training Time

FP= Feedback Presentation   SP= Stimulus Presentation

PS= Physical Similarity   TC= Task Commonality

RP= Response Presentation   TT= Training Time

CBI= Computer Based Instruction   ET= Embedded Training

IB= Instructor Based Instruction

FFSAT= Stand Alone Trainer

DATA CONTENTS:

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.14	0.11
CBI	4.00	1.00	0.50	0.20
FFSAT	7.00	2.00	1.00	1.00
ET	9.00	5.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.15	0.35	0.46

1ASP
C=.037

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.14
CBI	5.00	1.00	0.25	0.25
FFSAT	7.00	4.00	1.00	1.00
ET	7.00	4.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.14	0.41	0.41

1ARP
C=.054

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.14
CBI	5.00	1.00	0.25	0.25
FFSAT	7.00	4.00	1.00	1.00
ET	7.00	4.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.14	0.41	0.41

1AFP
C=.054

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	5.00	3.00	3.00
CBI	0.20	1.00	0.33	0.33
FFSAT	0.33	3.00	1.00	1.00
ET	0.33	3.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.52	0.08	0.20	0.20

1ATC
C=.016

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.11	0.11
CBI	5.00	1.00	0.20	0.20
FFSAT	9.00	5.00	1.00	1.00
ET	9.00	5.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.12	0.42	0.42

1APS
C=.051

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.20
CBI	3.00	1.00	0.33	0.33
FFSAT	5.00	3.00	1.00	1.00
ET	5.00	3.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.07	0.15	0.39	0.39

1ATT
C=.016

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.14	0.11
CBI	4.00	1.00	0.50	0.20
FFSAT	7.00	2.00	1.00	1.00
ET	9.00	5.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.15	0.35	0.46

1BSP
C=.037

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.14
CBI	5.00	1.00	0.25	0.25
FFSAT	7.00	4.00	1.00	1.00
ET	7.00	4.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.14	0.41	0.41

1BRP
C=.054

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.14
CBI	5.00	1.00	0.25	0.25
FFSAT	7.00	4.00	1.00	1.00
ET	7.00	4.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.14	0.41	0.41

1BFP
C=.054

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	5.00	3.00	3.00
CBI	0.20	1.00	0.33	0.33
FFSAT	0.33	3.00	1.00	1.00
ET	0.33	3.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.52	0.08	0.20	0.20

1BTC
C=.016

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.11	0.11
CBI	5.00	1.00	0.20	0.20
FFSAT	9.00	5.00	1.00	1.00
ET	9.00	5.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.12	0.42	0.42

1BFC
C=.051

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.20
CBI	3.00	1.00	0.33	0.33
FFSAT	5.00	3.00	1.00	1.00
ET	5.00	3.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.07	0.15	0.39	0.39

1BTT
C=.016

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.33	0.33
CBI	1.00	1.00	0.50	0.50
FFSAT	3.00	2.00	1.00	1.00
ET	3.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.13	0.16	0.35	0.35	ICSP c=.008

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.50	0.33	0.33
CBI	2.00	1.00	0.50	0.50
FFSAT	3.00	2.00	1.00	0.50
ET	3.00	2.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.11	0.19	0.29	0.41	ICRP C=.026

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.14
CBI	5.00	1.00	0.33	0.33
FFSAT	7.00	3.00	1.00	1.00
ET	7.00	3.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.05	0.16	0.39	0.39	ICFP c=.028

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	3.00	1.00	1.00
CBI	0.33	1.00	0.50	0.50
FFSAT	1.00	2.00	1.00	1.00
ET	1.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.31	0.13	0.28	0.28	ICTC c=.008

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.33	0.33
CBI	1.00	1.00	0.50	0.50
FFSAT	3.00	2.00	1.00	1.00
ET	3.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.13	0.16	0.35	0.35	ICPT c=.008

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.50	0.25	0.25
CBI	2.00	1.00	0.50	0.50
FFSAT	4.00	2.00	1.00	1.00
ET	4.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.09	0.18	0.36	0.36	ICTT c=.0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	1.00	1.00
CBI	1.00	1.00	1.00	1.00
FFSAT	1.00	1.00	1.00	1.00
ET	1.00	1.00	1.00	1.00

The DM subjective weights 10EP

IB	CBI	FFSAT	ET	
0.25	0.25	0.25	0.25	C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.14	0.20
CBI	3.00	1.00	0.33	0.50
FFSAT	7.00	3.00	1.00	2.00
ET	5.00	2.00	0.50	1.00

The DM subjective weights 10RP

IB	CBI	FFSAT	ET	
0.06	0.16	0.49	0.29	C=.007

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.14	0.20
CBI	3.00	1.00	0.33	0.50
FFSAT	7.00	3.00	1.00	2.00
ET	5.00	2.00	0.50	1.00

The DM subjective weights 10FP

IB	CBI	FFSAT	ET	
0.06	0.16	0.49	0.29	C=.007

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.50	1.00
CBI	1.00	1.00	0.50	1.00
FFSAT	2.00	2.00	1.00	2.00
ET	1.00	1.00	0.50	1.00

The DM subjective weights 10TC

IB	CBI	FFSAT	ET	
0.20	0.20	0.40	0.20	C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.14	0.14
CBI	4.00	1.00	0.50	0.50
FFSAT	7.00	2.00	1.00	1.00
ET	7.00	2.00	1.00	1.00

The DM subjective weights 10FS

IB	CBI	FFSAT	ET	
0.05	0.19	0.38	0.38	C=.00[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.50	0.33	0.33
CBI	2.00	1.00	0.50	0.50
FFSAT	3.00	2.00	1.00	1.00
ET	3.00	2.00	1.00	1.00

The DM subjective weights 10FT

IB	CBI	FFSAT	ET	
0.11	0.19	0.35	0.35	C=.004

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.13	0.13
CBI	4.00	1.00	0.50	0.50
FFSAT	8.00	2.00	1.00	1.00
ET	8.00	2.00	1.00	1.00

The DM subjective weights IESP

IB	CBI	FFSAT	ET	
0.05	0.19	0.38	0.38	C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.13	0.13
CBI	4.00	1.00	0.50	0.50
FFSAT	8.00	2.00	1.00	1.00
ET	8.00	2.00	1.00	1.00

The DM subjective weights IEAP

IB	CBI	FFSAT	ET	
0.05	0.19	0.38	0.38	C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.13	0.13
CBI	4.00	1.00	0.50	0.50
FFSAT	8.00	2.00	1.00	1.00
ET	8.00	2.00	1.00	1.00

The DM subjective weights IEFP

IB	CBI	FFSAT	ET	
0.05	0.19	0.38	0.38	C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.13	0.13
CBI	4.00	1.00	0.50	0.50
FFSAT	8.00	2.00	1.00	1.00
ET	8.00	2.00	1.00	1.00

The DM subjective weights IETC

IB	CBI	FFSAT	ET	
0.05	0.19	0.38	0.38	C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.13	0.13
CBI	4.00	1.00	0.50	0.50
FFSAT	8.00	2.00	1.00	1.00
ET	8.00	2.00	1.00	1.00

The DM subjective weights IEPC

IB	CBI	FFSAT	ET	
0.05	0.19	0.38	0.38	C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	[illegible]	[illegible]
CBI	3.00	1.00	[illegible]	[illegible]
FFSAT	8.00	2.00	1.00	1.00
ET	[illegible]	2.00	1.00	1.00

The DM subjective weights IETT

IB	CBI	FFSAT	ET	
0.07	0.19	0.37	0.37	C= [illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.13	0.13
CBI	4.00	1.00	0.50	0.50
FFSAT	8.00	2.00	1.00	1.00
ET	8.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.19	0.38	0.38

IFSF
C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.13	0.13
CBI	4.00	1.00	0.50	0.50
FFSAT	8.00	2.00	1.00	1.00
ET	8.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.19	0.38	0.38

IFRP
C=C

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.13	0.13
CBI	4.00	1.00	0.50	0.50
FFSAT	8.00	2.00	1.00	1.00
ET	8.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.19	0.38	0.38

IFFF
C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.20
CBI	3.00	1.00	0.50	0.50
FFSAT	5.00	2.00	1.00	1.00
ET	5.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.07	0.19	0.37	0.37

IFTC
C=.002

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.20
CBI	3.00	1.00	0.50	0.50
FFSAT	5.00	2.00	1.00	1.00
ET	5.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.07	0.19	0.37	0.37

I=P
C=.002

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.20
CBI	3.00	1.00	0.50	0.50
FFSAT	5.00	2.00	1.00	1.00
ET	5.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.07	0.19	0.37	0.37

IFTT
C=.002

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	1.00	1.00
CBI	1.00	1.00	1.00	1.00
FFSAT	1.00	1.00	1.00	1.00
ET	1.00	1.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.25	0.25	0.25	0.25

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.50	0.50	0.50
CBI	2.00	1.00	1.00	1.00
FFSAT	2.00	1.00	1.00	1.00
ET	2.00	1.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.14	0.29	0.29	0.29

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.50	0.50	0.50
CBI	2.00	1.00	1.00	1.00
FFSAT	2.00	1.00	1.00	1.00
ET	[illegible]	1.00	[illegible]	[illegible]

The DM subjective weights

IB	CBI	FFSAT	ET
0.14	0.29	0.29	0.29

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.50	0.50	0.50
CBI	2.00	1.00	1.00	1.00
FFSAT	2.00	1.00	1.00	1.00
ET	2.00	1.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.14	0.29	0.29	0.29

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.25	0.25
CBI	4.00	1.00	1.00	1.00
FFSAT	4.00	1.00	1.00	1.00
ET	4.00	1.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.08	0.31	0.31	0.31

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	1.00	1.00
CBI	1.00	1.00	[illegible]	[illegible]
FFSAT	1.00	1.00	1.00	1.00
ET	1.00	1.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.25	0.25	0.25	0.25

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.13	0.13
CBI	4.00	1.00	0.50	0.50
FFSAT	8.00	2.00	1.00	1.00
ET	8.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.19	0.38	0.38

IHSF C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.13	0.13
CBI	4.00	1.00	0.50	0.50
FFSAT	8.00	2.00	1.00	1.00
ET	8.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.19	0.38	0.38

IHRP C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.13	0.13
CBI	4.00	1.00	0.50	0.50
FFSAT	8.00	2.00	1.00	1.00
ET	8.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.19	0.38	0.38

IHFP C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.13	0.13
CBI	4.00	1.00	0.50	0.50
FFSAT	8.00	2.00	1.00	1.00
ET	8.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.19	0.38	0.38

IHTC C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.13	0.13
CBI	4.00	1.00	0.50	0.50
FFSAT	8.00	2.00	1.00	1.00
ET	8.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.19	0.38	0.38

IHRS C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.20
CBI	3.00	1.00	0.50	0.50
FFSAT	5.00	2.00	1.00	1.00
ET	5.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.07	0.19	0.37	0.37

IHTT C=.00[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.11	0.11
CBI	5.00	1.00	0.20	0.20
FFSAT	9.00	5.00	1.00	0.33
ET	9.00	5.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.12	0.31	0.53

2ASP
C=.110

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.11	0.11	0.11
CBI	9.00	1.00	0.20	0.14
FFSAT	9.00	5.00	1.00	0.33
ET	9.00	7.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.03	0.13	0.29	0.55

2ARP
C=.219

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	3.00	3.00	0.50
CBI	0.33	1.00	0.20	0.14
FFSAT	0.33	5.00	1.00	0.50
ET	2.00	7.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.29	0.06	0.20	0.44

2AFP
C=.095

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.11
FFSAT	7.00	5.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.11	0.38	0.47

2ATC
C=.120

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.14	0.14
CBI	3.00	1.00	0.17	0.11
FFSAT	7.00	6.00	1.00	0.50
ET	7.00	9.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.09	0.34	0.53

2ATS
C=.052

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	5.00	3.00	7.00
CBI	0.20	1.00	2.00	3.00
FFSAT	0.33	0.50	1.00	0.50
ET	0.14	0.33	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.58	0.19	0.11	0.12

2ATT
C=.014

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.11	0.11
CBI	5.00	1.00	0.20	0.20
FFSAT	9.00	5.00	1.00	0.33
ET	9.00	5.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.12	0.31	0.53

2BSP
c = .110

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.11	0.11	0.11
CBI	9.00	1.00	0.20	0.14
FFSAT	9.00	5.00	1.00	0.33
ET	9.00	7.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.03	0.13	0.29	0.55

2BRP
c = .219

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	3.00	3.00	0.50
CBI	0.33	1.00	0.20	0.14
FFSAT	0.33	5.00	1.00	0.50
ET	2.00	7.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.29	0.06	0.20	0.44

2BFP
c = .095

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.11
FFSAT	7.00	5.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.11	0.38	0.47

2BTC
c = .120

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.14	0.14
CBI	3.00	1.00	0.17	0.11
FFSAT	7.00	6.00	1.00	0.50
ET	7.00	9.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.09	0.34	0.53

2BPS
c = .082

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	5.00	3.00	7.00
CBI	0.20	1.00	0.50	0.33
FFSAT	0.33	2.00	1.00	0.50
ET	0.14	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.58	0.08	0.15	0.19

2BTT
c = .[illegible]3

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.11	0.11
CBI	5.00	1.00	0.20	0.20
FFSAT	9.00	5.00	1.00	0.33
ET	9.00	5.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.12	0.31	0.53

2CSP
C=.110

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.11	0.11	0.11
CBI	9.00	1.00	0.20	0.14
FFSAT	9.00	5.00	1.00	0.33
ET	9.00	7.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.03	0.13	0.29	0.55

2CRP
C=.219

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	3.00	3.00	0.50
CBI	0.33	1.00	0.20	0.14
FFSAT	0.33	5.00	1.00	0.50
ET	2.00	7.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.29	0.06	0.20	0.44

2CFP
C=.095

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.11
FFSAT	7.00	5.00	1.00	3.00
ET	9.00	9.00	0.33	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.11	0.49	0.36

2CTC
C=.231

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	3.00	7.00	7.00
CBI	0.33	1.00	6.00	9.00
FFSAT	0.14	0.17	1.00	2.00
ET	0.14	0.11	0.50	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.54	0.33	0.08	0.05

2CFS
C=.079

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	5.00	3.00	7.00
CBI	0.20	1.00	0.50	0.33
FFSAT	0.33	2.00	1.00	0.50
ET	0.14	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.58	0.08	0.15	0.19

2CTT
C=.112

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.11	0.11
CBI	5.00	1.00	0.20	0.20
FFSAT	9.00	5.00	1.00	0.33
ET	9.00	5.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
				2OSF
0.04	0.12	0.31	0.53	C=.06

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.11	0.11	0.11
CBI	9.00	1.00	0.20	0.14
FFSAT	9.00	5.00	1.00	0.33
ET	9.00	7.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
				2ORF
0.03	0.13	0.29	0.55	C=.219

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	3.00	3.00	0.50
CBI	0.33	1.00	0.20	0.14
FFSAT	0.33	5.00	1.00	0.50
ET	2.00	7.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
				2OFP
0.29	0.06	0.20	0.44	C=.095

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.11
FFSAT	7.00	5.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
				2OTC
0.04	0.11	0.38	0.47	C=.120

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.14	0.14
CBI	3.00	1.00	0.17	0.11
FFSAT	7.00	6.00	1.00	0.50
ET	7.00	9.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
				2OFI
0.05	0.09	0.34	0.53	[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	5.00	[illegible]	[illegible]
CBI	0.20	1.00	[illegible]	[illegible]
FFSAT	0.33	2.00	1.00	0.50
ET	0.14	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
				2OTT
0.58	0.08	0.15	0.19	C=.113

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.14	0.11	0.11
CBI	7.00	1.00	0.20	0.14
FFSAT	9.00	5.00	1.00	0.33
ET	9.00	7.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.12	0.29	0.55

RESP
C=.169

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.11	0.20	0.14
CBI	9.00	1.00	0.20	0.20
FFSAT	5.00	5.00	1.00	0.33
ET	7.00	5.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.17	0.28	0.51

RERP
C=.275

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.14	0.14	0.11
CBI	7.00	1.00	0.20	0.20
FFSAT	7.00	5.00	1.00	0.33
ET	9.00	5.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.14	0.29	0.53

RE FP
C=.16[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.11
FFSAT	7.00	5.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.11	0.38	0.47

RETC
C=.120

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.14	0.14
CBI	3.00	1.00	0.17	0.11
FFSAT	7.00	6.00	1.00	0.50
ET	7.00	9.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.09	0.34	0.53

RE OS
C=.0[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	5.00	3.00	7.00
CBI	0.20	1.00	2.00	7.00
FFSAT	0.33	0.50	1.00	2.00
ET	0.14	0.33	0.50	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.58	0.20	0.14	0.07

RETT
C=.0[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.11	0.11
CBI	5.00	1.00	0.20	0.20
FFSAT	9.00	5.00	1.00	0.33
ET	9.00	5.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.04	0.12	0.31	0.53	2FSP C=.110

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.11	0.11	0.11
CBI	9.00	1.00	0.20	0.14
FFSAT	9.00	5.00	1.00	0.33
ET	9.00	7.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.03	0.13	0.29	0.55	2FRP C=.219

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.33	0.50
CBI	3.00	1.00	0.20	0.14
FFSAT	3.00	5.00	1.00	0.50
ET	2.00	7.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.12	0.13	0.31	0.44	2FFP C=.255

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.11
FFSAT	7.00	5.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.04	0.11	0.38	0.47	2FTC C=.120

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	[illegible]	0.14
CBI	3.00	1.00	0.17	0.11
FFSAT	7.00	6.00	[illegible]	0.50
ET	7.00	9.00	2.[illegible]	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.05	0.09	0.34	0.53	2FPS C=.052

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	5.00	3.00	7.00
CBI	0.20	1.00	0.50	0.33
FFSAT	0.33	2.00	1.00	0.50
ET	0.14	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.58	0.08	0.15	0.19	2FTT C .11?

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.14	0.11	0.11
CBI	7.00	1.00	0.20	0.14
FFSAT	9.00	5.00	1.00	0.33
ET	9.00	7.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.12	0.29	0.55

2GSP
c=.109

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.11	0.20	0.14
CBI	9.00	1.00	0.20	0.20
FFSAT	5.00	5.00	1.00	0.33
ET	7.00	5.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.17	0.28	0.51

2GRP
C=.275

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.14	0.14	0.11
CBI	7.00	1.00	0.20	0.20
FFSAT	7.00	5.00	1.00	0.33
ET	9.00	5.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.14	0.29	0.53

2GFP
C=.163

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.11
FFSAT	7.00	5.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.11	0.38	0.47

2GTC
C=.120

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.14	0.14
CBI	3.00	1.00	0.17	0.11
FFSAT	7.00	6.00	1.00	0.50
ET	7.00	9.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.09	0.34	0.53

2GFS
.082

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	5.00	3.00	7.00
CBI	0.20	1.00	2.00	3.00
FFSAT	0.33	0.50	1.00	2.00
ET	0.14	0.33	0.50	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.58	0.20	0.14	0.07

2GTT
C=.09

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.14	0.11	0.11
CBI	7.00	1.00	0.20	0.14
FFSAT	9.00	5.00	1.00	0.33
ET	9.00	7.00	3.00	1.00

The DM subjective weights 2 HSF

IB	CBI	FFSAT	ET
0.04	0.12	0.29	0.55

C = .164

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.11	0.20	0.14
CBI	9.00	1.00	0.20	0.20
FFSAT	5.00	5.00	1.00	0.33
ET	7.00	5.00	3.00	1.00

The DM subjective weights 2 HRF

IB	CBI	FFSAT	ET
0.05	0.17	0.28	0.51

C = .275

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.14	0.14	0.11
CBI	7.00	1.00	0.20	0.20
FFSAT	7.00	5.00	1.00	0.33
ET	9.00	5.00	3.00	1.00

The DM subjective weights 2 - EP

IB	CBI	FFSAT	ET
0.04	0.14	0.29	0.53

C = .163

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.11
FFSAT	7.00	5.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights 2 HR

IB	CBI	FFSAT	ET
0.04	0.11	0.38	0.47

C = .120

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.14	0.14
CBI	3.00	1.00	0.17	0.11
FFSAT	7.00	6.00	1.00	0.50
ET	7.00	9.00	2.00	1.00

The DM subjective weights [illegible]

IB	CBI	FFSAT	ET
0.05	0.09	0.34	0.53

[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	5.00	3.00	7.00
CBI	0.20	1.00	2.00	3.00
FFSAT	0.33	0.50	1.00	2.00
ET	0.14	0.33	0.50	1.00

The DM subjective weights 2 HIT

IB	CBI	FFSAT	ET
0.59	0.20	0.14	0.07

C = .051

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.14
CBI	3.00	1.00	0.33	0.14
FFSAT	5.00	3.00	1.00	0.33
ET	7.00	7.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.06	0.11	0.25	0.58

3ASP
C=.053

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.14
CBI	3.00	1.00	0.33	0.20
FFSAT	5.00	3.00	1.00	0.33
ET	7.00	5.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.06	0.12	0.26	0.56

3ARP
C=.044

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.50	0.33	0.14
CBI	2.00	1.00	0.33	0.20
FFSAT	3.00	3.00	1.00	0.50
ET	7.00	5.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.07	0.11	0.27	0.54

3AFP
C=.016

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.14
CBI	3.00	1.00	0.33	0.20
FFSAT	5.00	3.00	1.00	0.33
ET	7.00	5.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.06	0.12	0.26	0.56

3ATC
C=.044

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.33	0.20
FFSAT	5.00	3.00	1.00	0.33
ET	9.00	5.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.12	0.26	0.58

3AFS
C=.029

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.33
FFSAT	7.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.14	0.35	0.46

3ATT
C=.086

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.14
FFSAT	7.00	5.00	1.00	0.33
ET	9.00	7.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.04	0.11	0.28	0.57	3BSP C=.121

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.33
FFSAT	7.00	5.00	1.00	0.33
ET	9.00	3.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.04	0.14	0.32	0.50	3BRP C=.128

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	0.48	3BFP C=.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.33
FFSAT	7.00	5.00	1.00	0.33
ET	9.00	3.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.04	0.14	0.32	0.50	3BTC C=.128

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.33
FFSAT	7.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.04	0.14	0.35	0.45	3BFS C=.086

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.33
FFSAT	7.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.04	0.14	0.35	0.46	3BTT C=.086

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	3.00	5.00	9.00
CBI	0.33	1.00	5.00	3.00
FFSAT	0.20	0.20	1.00	2.00
ET	0.11	0.33	0.50	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.58	0.26	0.10	0.06

3CSP
C=.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	3.00	5.00	9.00
CBI	0.33	1.00	5.00	3.00
FFSAT	0.20	0.20	1.00	2.00
ET	0.11	0.33	0.50	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.58	0.26	0.10	0.06

3CRP
C=.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	3.00	5.00	9.00
CBI	0.33	1.00	5.00	3.00
FFSAT	0.20	0.20	1.00	2.00
ET	0.11	0.33	0.50	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.58	0.26	0.10	0.06

3CFP
C=.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	3.00	5.00	9.00
CBI	0.33	1.00	5.00	3.00
FFSAT	0.20	0.20	1.00	2.00
ET	0.11	0.33	0.50	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.58	0.26	0.10	0.06

3CTC
C=.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	3.00	5.00	9.00
CBI	0.33	1.00	5.00	3.00
FFSAT	0.20	0.20	1.00	2.00
ET	0.11	0.33	0.50	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.58	0.26	0.10	0.06

3CTS
C=.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	3.00	5.00	9.00
CBI	0.33	1.00	5.00	3.00
FFSAT	0.20	0.20	1.00	2.00
ET	0.11	0.33	0.50	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.58	0.26	0.10	0.06

3CTT
C=.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.33
FFSAT	7.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights 3 0 S P

IB	CBI	FFSAT	ET	
0.04	0.14	0.35	0.45	C=.05[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights 3 0 R P

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	0.48	C=.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.0[illegible]	[illegible]	[illegible]	1.00

The DM subjective weights 3 0 F P

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	0.48	C=.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights 3 0 T C

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	0.48	C=.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights 3 0 P

IB	CBI	FFSAT	ET	
0.05	[illegible]	0.34	0.4[illegible]	C=.0[illegible]4

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	[illegible]	[illegible]
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights 3 0 T T

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	0.48	C=.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.33
FFSAT	7.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.14	0.35	0.46

3CCP
CF .086

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.33
FFSAT	7.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.14	0.35	0.46

3CRP
CF .086

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.33
FFSAT	7.00	5.00	1.00	0.50
ET	[illegible]	[illegible]	[illegible]	[illegible]

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.14	0.35	0.46

3EFP
CF .086

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.33
FFSAT	7.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.14	0.35	0.46

3ETC
CF .086

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.33
FFSAT	7.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.14	0.35	0.46

3EPS
CF .086

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	[illegible]	[illegible]	[illegible]	[illegible]
CBI	[illegible]	[illegible]	[illegible]	[illegible]
FFSAT	7.00	5.00	[illegible]	[illegible]
ET	9.00	[illegible]	[illegible]	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.04	0.14	[illegible]	[illegible]

3EIP
CF .086

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.13	0.34	0.48

3FSP
CF.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.13	0.34	0.48

3FRF
CF.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	[illegible]	[illegible]	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.13	0.34	0.48

3FFP
CF.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.13	0.34	0.48

3FTC
CF.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.13	0.34	0.48

3FTS
CF.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.13	0.34	0.48

3FTT
CF.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights 36 FP

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	0.48	CF,CL4

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights 36 FF

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	0.48	CF,C64

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights 36 FF

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	0.48	CF,C64

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights 36 FC

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	0.48	CF,C64

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights [illegible]

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	[illegible]	[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	[illegible]	[illegible]
CBI	3.00	1.00	[illegible]	[illegible]
FFSAT	5.00	5.00	1.00	[illegible]
ET	9.00	3.00	2.00	1.00

The DM subjective weights [illegible]

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	[illegible]	[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights 3H SP

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	0.48	CF=.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights 3H RF

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	0.48	CF=.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights 3H [illegible]

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	0.48	CF=.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights 3H TC

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	0.48	CF=.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights [illegible]

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	0.48	[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	[illegible]	[illegible]
CBI	3.00	1.00	[illegible]	[illegible]
FFSAT	5.00	5.00	[illegible]	0.50
ET	9.00	3.00	[illegible]	[illegible]

The DM subjective weights [illegible]

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	[illegible]	[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	3.00	1.00
CBI	1.00	1.00	5.00	5.00
FFSAT	0.33	0.20	1.00	1.00
ET	1.00	0.20	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.29	0.46	0.10	0.15	4ASP C=.1

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.33	9.00
CBI	1.00	1.00	9.00	9.00
FFSAT	3.00	0.11	1.00	1.00
ET	0.11	0.11	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.28	0.47	0.19	0.05	4ARP C=.654

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	5.00	5.00
CBI	3.00	1.00	1.00	0.33
FFSAT	0.20	1.00	1.00	0.50
ET	0.20	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.39	0.26	0.10	0.24	4AFP C=.619

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.20	5.00
CBI	1.00	1.00	0.25	0.17
FFSAT	5.00	4.00	1.00	1.00
ET	0.20	6.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.25	0.09	0.39	0.27	4ATC C=.638

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	9.00	9.00	9.00
CBI	0.11	1.00	5.00	5.00
FFSAT	0.11	0.20	1.00	1.00
ET	0.11	0.20	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.69	0.20	0.06	0.06	4APS C=.113

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	5.00	5.00
CBI	1.00	1.00	0.14	9.00
FFSAT	0.20	7.00	1.00	0.17
ET	0.20	0.11	6.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.32	0.28	0.24	0.16	4ATT C=1.82

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	9.00	9.00
CBI	1.00	1.00	0.33	5.00
FFSAT	0.11	3.00	1.00	1.00
ET	0.11	0.20	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.50	0.25	0.19	0.06

4BSP
C=.553

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	9.00	9.00
CBI	1.00	1.00	5.00	0.33
FFSAT	0.11	0.20	1.00	1.00
ET	0.11	3.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.50	0.25	0.06	0.19

4BRP
C=.553

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.50	9.00	9.00
CBI	2.00	1.00	5.00	0.20
FFSAT	0.11	0.20	1.00	1.00
ET	0.11	5.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.44	0.28	0.05	0.23

4CFP
C=1.03

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	3.00	5.00
CBI	1.00	1.00	5.00	5.00
FFSAT	0.33	0.20	1.00	1.00
ET	0.20	0.20	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.38	0.43	0.10	0.09

4BTC
C=.012

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	9.00	9.00
CBI	1.00	1.00	5.00	0.20
FFSAT	0.11	0.20	1.00	1.00
ET	0.11	5.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.49	0.23	0.06	0.22

4BFS
C=.787

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	5.00	5.00
CBI	1.00	1.00	5.00	5.00
FFSAT	0.20	0.20	1.00	1.00
ET	0.20	0.20	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.42	0.42	0.08	0.08

4BTT
C=.0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.50	5.00	5.00
CBI	2.00	1.00	5.00	5.00
FFSAT	0.20	0.20	1.00	5.00
ET	0.20	0.20	0.20	1.00

The DM subjective weights 4CSP

IB	CBI	FFSAT	ET
0.33	0.47	0.14	0.06

C=.159

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	9.00	0.33
CBI	1.00	1.00	5.00	5.00
FFSAT	0.11	0.20	1.00	1.00
ET	3.00	0.20	1.00	1.00

The DM subjective weights 4CRP

IB	CBI	FFSAT	ET
0.31	0.40	0.08	0.22

C=.509

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.50	9.00	9.00
CBI	2.00	1.00	5.00	5.00
FFSAT	0.11	0.20	1.00	1.00
ET	0.11	0.20	1.00	1.00

The DM subjective weights 4CFP

IB	CBI	FFSAT	ET
0.42	0.44	0.07	0.07

C=.078

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	9.00	9.00	5.00
CBI	0.11	1.00	5.00	5.00
FFSAT	0.11	0.20	1.00	1.00
ET	0.20	0.20	1.00	1.00

The DM subjective weights 4CTC

IB	CBI	FFSAT	ET
0.64	0.23	0.06	0.08

C=.205

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.11	0.11
CBI	1.00	1.00	0.11	0.11
FFSAT	9.00	9.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights 4CPS

IB	CBI	FFSAT	ET
0.05	0.05	0.45	0.45

C=.0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.20	0.11
CBI	1.00	1.00	0.20	0.20
FFSAT	5.00	5.00	1.00	1.00
ET	9.00	5.00	1.00	1.00

The DM subjective weights 4CTT

IB	CBI	FFSAT	ET
0.07	0.08	0.39	0.46

C=.016

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	7.00	5.00
CBI	1.00	1.00	9.00	9.00
FFSAT	0.14	0.11	1.00	1.00
ET	0.20	0.11	1.00	1.00

The DM subjective weights

4DSP

IB	CBI	FFSAT	ET
0.39	0.48	0.06	0.06

C=.02

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.20	0.20
CBI	1.00	1.00	3.00	5.00
FFSAT	5.00	0.33	1.00	1.00
ET	5.00	0.20	1.00	1.00

The DM subjective weights

4DRP

IB	CBI	FFSAT	ET
0.14	0.44	0.22	0.21

C=.509

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	5.00	2.00
CBI	1.00	1.00	5.00	5.00
FFSAT	0.20	0.20	1.00	1.00
ET	0.50	0.20	1.00	1.00

The DM subjective weights

4DFP

IB	CBI	FFSAT	ET
0.36	0.44	0.09	0.12

C=.04

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	5.00	5.00
CBI	1.00	1.00	5.00	1.00
FFSAT	0.20	0.20	1.00	1.00
ET	0.20	1.00	1.00	1.00

The DM subjective weights

4DTC

IB	CBI	FFSAT	ET
0.44	0.32	0.09	0.15

C=.125

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	9.00	9.00
CBI	1.00	1.00	9.00	5.00
FFSAT	0.11	0.11	1.00	1.00
ET	0.11	0.20	1.00	1.00

The DM subjective weights

4DPS

IB	CBI	FFSAT	ET
0.47	0.41	0.05	0.05

C=.06

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	5.00	5.00
CBI	1.00	1.00	9.00	9.00
FFSAT	0.20	0.11	1.00	9.00
ET	0.20	0.11	0.11	1.00

The DM subjective weights

4DTT

IB	CBI	FFSAT	ET
0.35	0.46	0.14	0.05

C=.245

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.11	0.11
CBI	1.00	1.00	0.11	0.11
FFSAT	9.00	9.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights 4ESP

IB	CBI	FFSAT	ET	
0.05	0.05	0.45	0.45	C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	2.00	2.00
CBI	1.00	1.00	5.00	5.00
FFSAT	0.50	0.20	1.00	1.00
ET	0.50	0.20	1.00	1.00

The DM subjective weights 4ERP

IB	CBI	FFSAT	ET	
0.30	0.47	0.12	0.12	C=.039

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.20	0.20
CBI	1.00	1.00	3.00	5.00
FFSAT	5.00	0.33	1.00	1.00
ET	5.00	0.20	1.00	1.00

The DM subjective weights 4EFP

IB	CBI	FFSAT	ET	
0.14	0.44	0.22	0.21	C=.504

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.33	0.33
CBI	1.00	1.00	5.00	0.33
FFSAT	3.00	0.20	1.00	1.00
ET	3.00	3.00	1.00	1.00

The DM subjective weights 4ETC

IB	CBI	FFSAT	ET	
0.12	0.28	0.23	0.37	C=.375

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.11	0.11
CBI	1.00	1.00	0.11	0.20
FFSAT	9.00	9.00	1.00	1.00
ET	9.00	5.00	1.00	1.00

The DM subjective weights 4EFC

IB	CBI	FFSAT	ET	
0.05	0.06	0.47	0.41	=.016

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	9.00	9.00
CBI	1.00	1.00	9.00	0.14
FFSAT	0.11	0.11	1.00	1.00
ET	0.11	7.00	1.00	1.00

The DM subjective weights 4ET1

IB	CBI	FFSAT	ET	
0.45	0.26	0.05	0.24	C=.120

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.11	0.11
CBI	1.00	1.00	0.11	0.11
FFSAT	9.00	9.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.05	0.45	0.45

4 FSP
C=C

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.11	0.11
CBI	1.00	1.00	0.11	0.11
FFSAT	9.00	9.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.05	0.45	0.45

4 FPP
C=C

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.11	0.11
CBI	1.00	1.00	0.11	0.11
FFSAT	9.00	9.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.05	0.45	0.45

4 FFP
C=C

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	3.00	5.00
CBI	1.00	1.00	1.00	1.00
FFSAT	0.33	1.00	1.00	1.00
ET	0.20	1.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.44	0.23	0.17	0.16

4 FTC
C=.047

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.11	0.11
CBI	1.00	1.00	0.11	0.11
FFSAT	9.00	9.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.05	0.45	0.45

4 FP
C=C

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.11	5.00
CBI	1.00	1.00	7.00	0.11
FFSAT	9.00	0.14	1.00	1.00
ET	0.20	9.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.22	0.24	0.27	0.27

[illegible]
C=0.0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	5.00	5.00
CBI	1.00	1.00	5.00	5.00
FFSAT	0.20	0.20	1.00	0.33
ET	0.20	0.20	3.00	1.00

The DM subjective weights

46 5P

IB	CBI	FFSAT	ET
0.41	0.41	0.07	0.12

C=.059

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.33	0.33
CBI	3.00	1.00	0.33	0.33
FFSAT	3.00	3.00	1.00	0.33
ET	3.00	3.00	3.00	1.00

The DM subjective weights

46 RP

IB	CBI	FFSAT	ET
0.10	0.17	0.27	0.46

C=.117

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	3.00	5.00
CBI	1.00	1.00	5.00	3.00
FFSAT	0.33	0.20	1.00	1.00
ET	0.20	0.33	1.00	1.00

The DM subjective weights

46 FP

IB	CBI	FFSAT	ET
0.40	0.40	0.10	0.10

C=.024

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.11	0.11
CBI	1.00	1.00	0.11	0.11
FFSAT	9.00	9.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights

46 TC

IB	CBI	FFSAT	ET
0.05	0.05	0.45	0.45

C=.~~024~~ .C

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.11	0.11
CBI	1.00	1.00	0.11	0.11
FFSAT	9.00	9.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights

46 P

IB	CBI	FFSAT	ET
0.05	0.05	0.45	0.45

= C

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	5.00	5.00
CBI	1.00	1.00	3.00	3.00
FFSAT	0.20	0.33	1.00	0.50
ET	0.20	0.33	2.00	1.00

The DM subjective weights

46 TT

IB	CBI	FFSAT	ET
0.44	0.35	0.09	0.12

C=.0[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.11	0.11
CBI	1.00	1.00	0.11	0.11
FFSAT	9.00	9.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights 4 H SP

IB	CBI	FFSAT	ET	
0.05	0.05	0.45	0.45	C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.11	0.11
CBI	1.00	1.00	0.11	0.11
FFSAT	9.00	9.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights 4 H RP

IB	CBI	FFSAT	ET	
0.05	0.05	0.45	0.45	C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	5.00	5.00
CBI	1.00	1.00	3.00	3.00
FFSAT	0.20	0.33	1.00	1.00
ET	0.20	0.33	1.00	1.00

The DM subjective weights 4 H FP

IB	CBI	FFSAT	ET	
0.45	0.35	0.10	0.10	C=.012

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.11	0.11
CBI	1.00	1.00	0.11	3.00
FFSAT	9.00	9.00	1.00	1.00
ET	9.00	0.33	1.00	1.00

The DM subjective weights 4 H TC

IB	CBI	FFSAT	ET	
0.05	0.19	0.47	0.28	C=.654

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.11	0.11
CBI	1.00	1.00	0.11	0.11
FFSAT	9.00	9.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights 4 H F

IB	CBI	FFSAT	ET	
0.05	0.05	0.45	0.45	C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.11	0.11
CBI	1.00	1.00	0.11	0.11
FFSAT	9.00	9.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights 4 H TT

IB	CBI	FFSAT	ET	
0.05	0.05	0.45	0.45	C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.20	0.14
CBI	5.00	1.00	4.00	4.00
FFSAT	5.00	0.25	1.00	6.00
ET	7.00	0.25	0.17	1.00

The DM subjective weights 5 ASP C= .342

IB	CBI	FFSAT	ET
0.06	0.49	0.29	0.16

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.20	0.14
CBI	5.00	1.00	0.20	6.00
FFSAT	5.00	5.00	1.00	6.00
ET	7.00	0.17	0.17	1.00

The DM subjective weights 5 ARP C= .40

IB	CBI	FFSAT	ET
0.06	0.25	0.54	0.15

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.33	0.14
CBI	3.00	1.00	4.00	0.14
FFSAT	3.00	[illegible]	[illegible]	[illegible]
ET	7.00	[illegible]	[illegible]	[illegible]

The DM subjective weights 5 AFP C= .16

IB	CBI	FFSAT	ET
0.06	0.19	0.11	0.65

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	3.00	0.14
CBI	5.00	1.00	5.00	0.20
FFSAT	0.33	0.20	1.00	0.20
ET	7.00	5.00	5.00	1.00

The DM subjective weights 5 ATC

IB	CBI	FFSAT	ET
0.10	0.25	0.06	0.58

C = .189

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	3.00	0.14
CBI	5.00	1.00	3.00	0.20
FFSAT	0.33	0.33	1.00	0.20
ET	7.00	5.00	5.00	1.00

The DM subjective weights 5 AP[illegible]

IB	CBI	FFSAT	ET
0.1[illegible]	0.23	0.07	0.59

C =[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.33	0.14
CBI	5.00	1.00	3.00	4.00
FFSAT	3.00	0.33	1.00	0.33
ET	7.00	0.25	3.00	1.00

The DM subjective weights C = .124

IB .06 CBI .50 FFSAT .14 ET .29 5 ATT

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.14	0.20	0.20
CBI	7.00	1.00	5.00	4.00
FFSAT	5.00	0.20	1.00	0.33
ET	5.00	0.25	3.00	1.00

The DM subjective weights 5BSP C = .116

IB	CBI	FFSAT	ET
0.05	0.57	0.14	0.24

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.14	0.20	0.20
CBI	7.00	1.00	7.00	5.00
FFSAT	5.00	0.14	1.00	0.33
ET	5.00	0.20	3.00	1.00

The DM subjective weights 5BRP C = .152

IB	CBI	FFSAT	ET
0.05	0.61	0.13	0.21

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.20	0.14
CBI	5.00	1.00	4.00	0.20
FFSAT	5.00	0.25	1.00	0.20
ET	7.00	5.00	5.00	1.00

The DM subjective weights 5BFP C = .179

IB	CBI	FFSAT	ET
0.05	0.24	0.14	0.58

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	3.00	0.20
CBI	3.00	1.00	5.00	0.33
FFSAT	0.33	0.20	1.00	0.20
ET	5.00	3.00	5.00	1.00

The DM subjective weights 5BTC C = .075

IB	CBI	FFSAT	ET
0.13	0.27	0.07	0.53

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.33	0.33
CBI	5.00	1.00	7.00	5.00
FFSAT	3.00	0.14	1.00	0.33
ET	3.00	0.20	3.00	1.00

The DM subjective weights 5BPT C = .126

IB	CBI	FFSAT	ET
0.07	0.51	0.12	0.20

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.33	0.33
CBI	5.00	1.00	5.00	3.00
FFSAT	3.00	0.20	1.00	0.33
ET	3.00	0.33	3.00	1.00

The DM subjective weights 5BTT C = .036

IB	CBI	FFSAT	ET
0.08	0.54	0.14	0.24

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	7.00	7.00	0.14
CBI	0.14	1.00	4.00	0.14
FFSAT	0.14	0.25	1.00	0.14
ET	7.00	7.00	7.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.26	0.10	0.05	0.59	SCEP CI=.304

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	5.00	6.00	0.14
CBI	0.20	1.00	0.20	0.20
FFSAT	0.17	5.00	1.00	0.20
ET	7.00	5.00	5.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.25	0.06	0.14	0.55	SCRP CI=.334

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	3.00	3.00	0.20
CBI	0.33	1.00	4.00	0.14
FFSAT	0.33	0.25	1.00	0.14
ET	5.00	7.00	7.00	[illegible]

The DM subjective weights

IB	CBI	FFSAT	ET	
0.19	0.13	0.06	0.63	SCFP CI=.122

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	1.00	1.00
CBI	1.00	1.00	1.00	0.20
FFSAT	1.00	1.00	1.00	0.14
ET	1.00	5.00	7.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.23	0.14	0.13	0.50	SCTC CI=.153

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	1.00	0.20
CBI	1.00	1.00	1.00	0.14
FFSAT	1.00	1.00	1.00	0.14
ET	5.00	7.00	7.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.11	0.11	0.11	0.67	[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	[illegible]	[illegible]
CBI	1.00	1.00	[illegible]	[illegible]
FFSAT	1.00	1.00	1.00	[illegible]
ET	5.00	7.00	7.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.11	0.11	0.11	0.67	[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	5.00	5.00	0.14
CBI	0.20	1.00	4.00	0.20
FFSAT	0.20	0.25	1.00	0.20
ET	7.00	5.00	5.00	1.00

The DM subjective weights 5CSP

IB	CBI	FFSAT	ET	
0.25	0.13	0.06	0.56	C = .30

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	2.00	2.00	0.20
CBI	0.50	1.00	2.00	0.20
FFSAT	0.50	0.50	1.00	0.20
ET	5.00	5.00	5.00	1.00

The DM subjective weights 5CKP

IB	CBI	FFSAT	ET	
0.18	0.13	0.09	0.61	C = .046

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	3.00	3.00	0.20
CBI	0.33	1.00	2.00	0.20
FFSAT	0.33	0.50	1.00	0.20
ET	5.00	5.00	5.00	1.00

The DM subjective weights 5CFP

IB	CBI	FFSAT	ET	
0.22	0.12	0.08	0.59	C = .081

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	1.00	0.20
CBI	1.00	1.00	1.00	0.20
FFSAT	1.00	1.00	1.00	0.20
ET	5.00	5.00	5.00	1.00

The DM subjective weights 5CTC

IB	CBI	FFSAT	ET	
0.13	0.13	0.13	0.63	C = 0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	1.00	0.20
CBI	1.00	1.00	1.00	0.20
FFSAT	1.00	1.00	1.00	0.20
ET	5.00	5.00	5.00	1.00

The DM subjective weights 5CPC

IB	CBI	FFSAT	ET	
0.13	0.13	0.13	0.63	C = 0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	3.00	0.20
CBI	1.00	1.00	3.00	0.20
FFSAT	0.33	0.33	1.00	0.20
ET	5.00	5.00	5.00	1.00

The DM subjective weights 5TTT

IB	CBI	FFSAT	ET	
0.16	0.16	0.07	0.60	C = .058

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.20	0.20
CBI	5.00	1.00	1.00	7.00
FFSAT	5.00	1.00	1.00	7.00
ET	5.00	0.14	0.14	1.00

The DM subjective weights SESR

IB	CBI	FFSAT	ET	
0.06	0.41	0.41	0.13	C=,209

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.14
CBI	5.00	1.00	0.20	0.14
FFSAT	7.00	5.00	1.00	0.14
ET	7.00	7.00	7.00	1.00

The DM subjective weights SEKR

IB	CBI	FFSAT	ET	
0.05	0.11	0.24	0.60	C=,278

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.14
CBI	3.00	1.00	6.00	0.14
FFSAT	5.00	0.17	1.00	0.14
ET	7.00	7.00	7.00	1.00

The DM subjective weights SEFF

IB	CBI	FFSAT	ET	
0.05	0.21	0.13	0.61	C=,347

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	1.00	1.00
CBI	1.00	1.00	0.14	0.33
FFSAT	1.00	7.00	1.00	7.00
ET	1.00	3.00	0.14	1.00

The DM subjective weights SETC

IB	CBI	FFSAT	ET	
0.22	0.11	0.51	0.17	C=,250

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.20
CBI	5.00	1.00	0.20	0.33
FFSAT	7.00	5.00	1.00	7.00
ET	5.00	3.00	0.14	1.00

The DM subjective weights SEFF

IB	CBI	FFSAT	ET	
0.05	0.14	0.51	0.20	[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	[illegible]	[illegible]
CBI	5.00	1.00	[illegible]	[illegible]
FFSAT	7.00	5.00	[illegible]	[illegible]
ET	5.00	0.33	0.14	[illegible]

The DM subjective weights SEFT

IB	CBI	FFSAT	ET	
0.05	0.21	0.61	0.13	C=,[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.14	0.20	0.20
CBI	7.00	1.00	5.00	5.00
FFSAT	5.00	0.20	1.00	1.00
ET	5.00	0.20	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	5FSP
0.05	0.61	0.17	0.17	C=.079

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.14	0.20	0.20
CBI	7.00	1.00	5.00	5.00
FFSAT	5.00	0.20	1.00	1.00
ET	5.00	0.20	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	5FRP
0.05	0.61	0.17	0.17	C=.079

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.14	0.20	0.20
CBI	7.00	1.00	7.00	5.00
FFSAT	5.00	0.14	1.00	1.00
ET	5.00	0.20	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	5FFP
0.05	0.63	0.16	0.16	C=.106

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.33	0.33
CBI	5.00	1.00	5.00	5.00
FFSAT	3.00	0.20	1.00	1.00
ET	3.00	0.20	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	5FFC
0.07	0.60	0.16	0.16	C=.058

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.20	0.20
CBI	5.00	1.00	5.00	5.00
FFSAT	5.00	0.20	1.00	1.00
ET	5.00	0.20	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	5F[illegible]
0.06	0.58	0.18	0.18	C=[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.14	0.33	0.33
CBI	7.00	1.00	7.00	5.00
FFSAT	3.00	0.14	1.00	1.00
ET	3.00	0.20	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	5FFT
0.06	0.65	0.14	0.15	C=.095

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.20	0.20
CBI	5.00	1.00	3.00	3.00
FFSAT	5.00	0.33	1.00	5.00
ET	5.00	0.33	0.20	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	5G SP
0.06	0.46	0.32	0.16	C=.192

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.33	0.20
CBI	5.00	1.00	5.00	5.00
FFSAT	3.00	0.20	1.00	0.33
ET	5.00	0.20	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	5G RP
0.07	0.57	0.12	0.24	C=.131

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.20	0.20
CBI	5.00	1.00	5.00	5.00
FFSAT	5.00	0.20	1.00	1.00
ET	5.00	0.20	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	5G FF
0.06	0.58	0.18	0.18	C=.128

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.14	0.20	0.20
CBI	7.00	1.00	3.00	5.00
FFSAT	5.00	0.33	1.00	1.00
ET	5.00	0.20	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	5G TC
0.05	0.56	0.20	0.18	C=.054

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.20	0.20
CBI	5.00	1.00	5.00	7.00
FFSAT	5.00	0.20	1.00	1.00
ET	5.00	0.14	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	5G IC
0.06	0.60	0.17	0.16	C=.1[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.20	0.20
CBI	5.00	1.00	5.00	5.00
FFSAT	5.00	0.20	1.00	1.00
ET	5.00	0.20	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	5G TT
0.06	0.58	0.18	0.18	C=.138

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.20	0.20
CBI	5.00	1.00	6.00	7.00
FFSAT	5.00	0.17	1.00	7.00
ET	5.00	0.14	0.14	1.00

The DM subjective weights SHSP

IB	CBI	FFSAT	ET	
0.06	0.56	0.25	0.12	CI .39

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.14
CBI	5.00	1.00	0.20	0.14
FFSAT	7.00	5.00	1.00	0.14
ET	7.00	7.00	7.00	1.00

The DM subjective weights SHRP

IB	CBI	FFSAT	ET	
0.05	0.11	0.24	0.60	CI .278

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.14
CBI	3.00	1.00	6.00	0.14
FFSAT	5.00	0.17	1.00	0.14
ET	7.00	7.00	7.00	1.00

The DM subjective weights SHPP

IB	CBI	FFSAT	ET	
0.05	0.21	0.13	0.61	CI=.347

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	1.00	1.00
CBI	1.00	1.00	0.14	0.33
FFSAT	1.00	7.00	1.00	7.00
ET	1.00	3.00	0.14	1.00

The DM subjective weights SHTC

IB	CBI	FFSAT	ET	
0.22	0.11	0.51	0.17	CI=.250

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.20
CBI	5.00	1.00	0.20	0.33
FFSAT	7.00	5.00	1.00	7.00
ET	5.00	3.00	0.14	1.00

The DM subjective weights SHTS

IB	CBI	FFSAT	ET	
0.05	0.14	0.61	0.20	CI=.158

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.20
CBI	5.00	1.00	0.20	0.33
FFSAT	7.00	5.00	1.00	7.00
ET	5.00	3.00	0.14	1.00

The DM subjective weights SHTT

IB	CBI	FFSAT	ET	
0.05	0.14	0.61	0.20	CI=.158

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.20	0.20
CBI	1.00	1.00	0.20	0.20
FFSAT	5.00	5.00	1.00	1.00
ET	5.00	5.00	1.00	1.00

The DM subjective weights 6 ASP

IB	CBI	FFSAT	ET	
0.02	0.08	0.42	0.42	C= 0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.20
CBI	3.00	1.00	0.33	0.20
FFSAT	5.00	3.00	1.00	0.33
ET	5.00	5.00	3.00	1.00

The DM subjective weights 6ARP

IB	CBI	FFSAT	ET	
0.07	0.13	0.27	0.53	C=,075

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.20
CBI	3.00	1.00	0.33	0.33
FFSAT	5.00	3.00	1.00	1.00
ET	5.00	3.00	1.00	1.00

The DM subjective weights 6AFP

IB	CBI	FFSAT	ET	
0.07	0.15	0.39	0.39	C=,016

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.33	0.33
CBI	1.00	1.00	0.33	0.33
FFSAT	3.00	3.00	1.00	3.00
ET	3.00	3.00	0.33	1.00

The DM subjective weights 6AIC

IB	CBI	FFSAT	ET	
0.12	0.12	0.47	0.28	C=,057

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	3.00	1.00	1.00
CBI	0.33	1.00	0.20	0.20
FFSAT	1.00	5.00	1.00	0.33
ET	1.00	5.00	3.00	1.00

The DM subjective weights 6APC

IB	CBI	FFSAT	ET	
0.29	0.07	0.25	0.41	C=,0[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.20
CBI	3.00	1.00	0.20	0.20
FFSAT	5.00	5.00	1.00	0.33
ET	5.00	5.00	3.00	1.00

The DM subjective weights 6ATT

IB	CBI	FFSAT	ET	
0.07	0.12	0.30	0.51	C=.[illegible]8

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	3.00	0.33	0.20
CBI	0.33	1.00	0.20	0.14
FFSAT	3.00	5.00	1.00	0.33
ET	5.00	7.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.12	0.06	0.26	0.56

6BSP
C=.044

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.20
CBI	3.00	1.00	0.33	0.33
FFSAT	5.00	3.00	1.00	0.33
ET	5.00	3.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.07	0.15	0.29	0.49

6BAP
C=.074

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.20
CBI	3.00	1.00	0.33	0.20
FFSAT	5.00	3.00	1.00	1.00
ET	5.00	5.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.07	0.13	0.37	0.43

6BFP
C=.043

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.33	0.33
CBI	1.00	1.00	0.20	0.20
FFSAT	3.00	5.00	1.00	1.00
ET	3.00	5.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.12	0.09	0.40	0.40

6BTC
C=.012

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.14
CBI	3.00	1.00	0.33	0.20
FFSAT	5.00	3.00	1.00	0.33
ET	7.00	5.00	3.00	1.00

The DM subjective weights

C=.049

IB	CBI	FFSAT	ET
0.06	0.12	0.26	0.56

6BPS

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.33	0.33
CBI	5.00	1.00	0.33	0.33
FFSAT	3.00	3.00	1.00	1.00
ET	3.00	3.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.09	0.20	0.35	0.35

6BTT
C=[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.14	0.11
CBI	4.00	1.00	0.50	0.20
FFSAT	7.00	2.00	1.00	1.00
ET	9.00	5.00	1.00	1.00

The DM subjective weights 6CSP

IB	CBI	FFSAT	ET
0.05	0.15	0.35	0.46

CF.037

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.11	0.20	0.14
CBI	9.00	1.00	0.20	0.20
FFSAT	5.00	5.00	1.00	0.33
ET	7.00	5.00	3.00	1.00

The DM subjective weights 6CRP

IB	CBI	FFSAT	ET
0.05	0.17	0.28	0.51

CF.275

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.33	0.50
CBI	3.00	1.00	0.20	0.14
FFSAT	3.00	5.00	1.00	0.50
ET	2.00	7.00	2.00	1.00

The DM subjective weights 6CFP

IB	CBI	FFSAT	ET
0.12	0.13	0.31	0.44

CF.255

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.50	1.00
CBI	1.00	1.00	0.50	1.00
FFSAT	2.00	2.00	1.00	2.00
ET	1.00	1.00	0.50	1.00

The DM subjective weights 6C7C

IB	CBI	FFSAT	ET
0.20	0.20	0.40	0.20

CF 0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.14	0.14
CBI	4.00	1.00	0.50	0.50
FFSAT	7.00	2.00	1.00	1.00
ET	7.00	2.00	1.00	1.00

The DM subjective weights [illegible]

IB	CBI	FFSAT	ET
[illegible]	0.19	0.38	0.38

CF [illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	5.00	[illegible]	[illegible]
CBI	0.20	1.00	4.00	[illegible]
FFSAT	0.20	0.25	1.00	[illegible]
ET	7.00	5.00	5.00	[illegible]

The DM subjective weights 6CTT

IB	CBI	FFSAT	ET
[illegible]	[illegible]	[illegible]	[illegible]

CF.30

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	3.00	3.00	0.20
CBI	0.33	1.00	2.00	0.20
FFSAT	0.33	0.50	1.00	0.20
ET	5.00	5.00	5.00	1.00

The DM subjective weights 6.05P

IB	CBI	FFSAT	ET
0.22	0.12	0.08	0.59

C= ,081

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.33	0.50
CBI	3.00	1.00	0.20	0.14
FFSAT	3.00	5.00	1.00	0.50
ET	2.00	7.00	2.00	1.00

The DM subjective weights 60RP

IB	CBI	FFSAT	ET
0.12	0.13	0.31	0.44

C=,255

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.14	0.20
CBI	3.00	1.00	0.33	0.50
FFSAT	7.00	3.00	1.00	2.00
ET	5.00	2.00	0.50	1.00

The DM subjective weights 6DFP

IB	CBI	FFSAT	ET
0.06	0.16	0.49	0.29

C= ,007

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.14	0.14
CBI	3.00	1.00	0.17	0.11
FFSAT	7.00	6.00	1.00	0.50
ET	7.00	9.00	2.00	1.00

The DM subjective weights 60TC

IB	CBI	FFSAT	ET
0.05	0.09	0.34	0.53

C= ,092

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.11	0.11
CBI	1.00	1.00	0.11	0.20
FFSAT	9.00	9.00	1.00	1.00
ET	9.00	5.00	1.00	1.00

The DM subjective weights 60F[illegible]

IB	CBI	FFSAT	ET
0.05	0.06	0.47	0.41

C= .016

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.20	0.20
CBI	1.00	1.00	0.20	0.20
FFSAT	5.00	5.00	1.00	1.00
ET	5.00	5.00	1.00	1.00

The DM subjective weights 60TT

IB	CBI	FFSAT	ET
0.08	0.08	0.42	0.42

C= [illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.20	0.20
CBI	1.00	1.00	0.20	0.20
FFSAT	5.00	5.00	1.00	1.00
ET	5.00	5.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.08	0.08	0.42	0.42

6ESF C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.20
CBI	3.00	1.00	0.33	0.33
FFSAT	5.00	3.00	1.00	0.33
ET	5.00	3.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.07	0.15	0.29	0.49

6ERP C=,074

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.20
CBI	3.00	1.00	0.33	0.33
FFSAT	5.00	3.00	1.00	1.00
ET	5.00	3.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.07	0.15	0.39	0.39

6EFP C=,016

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.11	0.11
CBI	1.00	1.00	0.11	0.11
FFSAT	9.00	9.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.05	0.45	0.45

6ETC C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.20
CBI	3.00	1.00	0.50	0.50
FFSAT	5.00	2.00	1.00	1.00
ET	5.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.07	0.19	0.37	0.37

6EFS C=,002

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.13	0.13
CBI	4.00	1.00	0.50	0.50
FFSAT	8.00	2.00	1.00	1.00
ET	8.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET
0.05	0.19	0.38	0.38

6ETT C=0

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	5.00	5.00
CBI	1.00	1.00	5.00	5.00
FFSAT	0.20	0.20	1.00	0.33
ET	0.20	0.20	3.00	1.00

The DM subjective weights 6 FSP

IB	CBI	FFSAT	ET
0.41	0.41	0.07	0.12

C=.054

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.33	0.33
CBI	1.00	1.00	0.20	0.20
FFSAT	3.00	5.00	1.00	1.00
ET	3.00	5.00	1.00	1.00

The DM subjective weights 6FRP

IB	CBI	FFSAT	ET
0.12	0.09	0.40	0.40

C=.012

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.14
CBI	3.00	1.00	0.33	0.20
FFSAT	5.00	3.00	1.00	0.33
ET	7.00	5.00	3.00	1.00

The DM subjective weights 6 FFP

IB	CBI	FFSAT	ET
0.06	0.12	0.26	0.56

C=.044

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	3.00	0.20
CBI	3.00	1.00	5.00	0.33
FFSAT	0.33	0.20	1.00	0.20
ET	5.00	3.00	5.00	1.00

The DM subjective weights 6FTC

IB	CBI	FFSAT	ET
0.13	0.27	0.07	0.53

C=.075

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.20
CBI	5.00	1.00	0.20	0.33
FFSAT	7.00	5.00	1.00	7.00
ET	5.00	3.00	0.14	1.00

The DM subjective weights 6 FPS

IB	CBI	FFSAT	ET
0.05	0.14	0.61	0.20

C=.155

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	0.33	0.33
CBI	1.00	1.00	0.33	0.33
FFSAT	3.00	3.00	1.00	3.00
ET	3.00	3.00	0.33	1.00

The DM subjective weights 6FTT

IB	CBI	FFSAT	ET
0.12	0.12	0.47	0.28

C=[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	3.00	0.33	0.20
CBI	0.33	1.00	0.20	0.14
FFSAT	3.00	5.00	1.00	0.33
ET	5.00	7.00	3.00	1.00

The DM subjective weights 6 GSF

IB	CBI	FFSAT	ET	
0.12	0.06	0.26	0.56	C=.044

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.11
FFSAT	7.00	5.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights 6 GRF

IB	CBI	FFSAT	ET	
0.04	0.11	0.38	0.47	C=.12

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.20
CBI	3.00	1.00	0.33	0.33
FFSAT	5.00	3.00	1.00	1.00
ET	5.00	3.00	1.00	1.00

The DM subjective weights 6 GFF

IB	CBI	FFSAT	ET	
0.07	0.15	0.39	0.39	C=.016

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.11
CBI	5.00	1.00	0.20	0.11
FFSAT	7.00	5.00	1.00	1.00
ET	9.00	9.00	1.00	1.00

The DM subjective weights 6 GTC

IB	CBI	FFSAT	ET	
0.04	0.11	0.38	0.47	C=.12

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights 6 GF[illegible]

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	0.48	C=.01[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.20
CBI	3.00	1.00	0.20	0.20
FFSAT	5.00	5.00	1.00	0.33
ET	5.00	5.00	3.00	1.00

The DM subjective weights 6 GTT

IB	CBI	FFSAT	ET	
0.07	0.12	0.30	0.51	C=.118

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	1.00	3.00	5.00
CBI	1.00	1.00	1.00	1.00
FFSAT	0.33	1.00	1.00	1.00
ET	0.20	1.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.44	0.23	0.17	0.16	6HSP C=.067

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.25	0.14	0.14
CBI	4.00	1.00	0.50	0.50
FFSAT	7.00	2.00	1.00	1.00
ET	7.00	2.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.05	0.19	0.38	0.38	6HRP C=.001

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.14	0.20
CBI	5.00	1.00	0.20	0.33
FFSAT	7.00	5.00	1.00	7.00
ET	5.00	3.00	0.14	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.05	0.14	0.61	0.20	6HFP C=.188

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.11
CBI	3.00	1.00	0.20	0.33
FFSAT	5.00	5.00	1.00	0.50
ET	9.00	3.00	2.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.05	0.13	0.34	0.48	6HTC C=.064

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.33	0.20	0.20
CBI	3.00	1.00	0.33	0.20
FFSAT	5.00	3.00	1.00	0.33
ET	5.00	5.00	3.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.07	0.13	0.27	0.53	6HPC C=.3[illegible]

The Eigenvector Pairwise comparisons

	IB	CBI	FFSAT	ET
IB	1.00	0.20	0.33	0.33
CBI	5.00	1.00	0.33	0.33
FFSAT	3.00	3.00	1.00	1.00
ET	3.00	3.00	1.00	1.00

The DM subjective weights

IB	CBI	FFSAT	ET	
0.09	0.20	0.35	0.35	6HTF C=.13[illegible]

APPENDIX E: TOPSIS INDIVIDUAL RANKINGS

This appendix provides the individual subject matter expert rankings of the training alternatives for each task using the Technique for Order Preference by Similarity to the Ideal Solution.

The values in the decision matrix were obtained from the DM subjective weights found in Appendix D.

The Eigenvector Pairwise comparisons section provides the criteria versus goal pairwise comparison input from that portion of the questionnaire. It is the same for each subject matter expert.

The DM subjective weights in this appendix are the results of the eigenvector calculation of the criteria importance and are the weights used in Step 2 of TOPSIS (see Appendix C).

The rank order section provides the subject matter experts alternative ranking for that particular task based on c values or relative closeness to the ideal solution.

DATA CONTENTS:

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.05	0.05	0.05	0.52	0.04	0.07
Comp Based Instr	0.15	0.14	0.14	0.08	0.12	0.15
Stand Alone Trnr	0.35	0.41	0.41	0.20	0.42	0.39
Embedded Tng	0.46	0.41	0.41	0.20	0.42	0.39

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	1.00	0.33	3.00	4.00
Respons	1.00	1.00	1.00	0.33	3.00	4.00
Feedbac	1.00	1.00	1.00	0.33	3.00	4.00
Task Co	3.00	3.00	3.00	1.00	5.00	5.00
Phy Sim	0.33	0.33	0.33	0.20	1.00	3.00
Tng Tim	0.25	0.25	0.25	0.20	0.33	1.00

C..031

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.16	0.16	0.16	0.39	0.07	0.04

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.46	0.41	0.41	0.52	0.42	0.39

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.05	0.05	0.05	0.08	0.04	0.07

Rank Order: Relative Closeness to the Ideal Solution

Instr Based Instr	0.61
Embedded Tng	0.49
Stand Alone Trnr	0.47
Comp Based Instr	0.12

SME #1

TASK A:

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.04	0.03	0.29	0.04	0.05	0.58
Comp Based Instr	0.12	0.13	0.06	0.11	0.09	0.19
Stand Alone Trnr	0.31	0.29	0.20	0.38	0.34	0.11
Embedded Tng	0.53	0.55	0.44	0.47	0.53	0.12

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.11	0.14	0.14	0.20
Respons	1.00	1.00	0.33	0.20	0.20	0.33
Feedbac	9.00	3.00	1.00	0.33	0.33	0.25
Task Co	7.00	5.00	3.00	1.00	3.00	2.00
Phy Sim	7.00	5.00	3.00	0.33	1.00	1.00
Tng Tim	5.00	3.00	4.00	0.50	1.00	1.00

C =.055

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.04	0.05	0.13	0.35	0.22	0.21

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.53	0.55	0.44	0.47	0.53	0.58

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.04	0.03	0.06	0.04	0.05	0.11

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	0.67
Stand Alone Trnr	0.54
Instr Based Instr	0.36
Comp Based Instr	0.14

SME #2

TASK A

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.06	0.06	0.07	0.06	0.05	0.04
Comp Based Instr	0.11	0.12	0.11	0.12	0.12	0.14
Stand Alone Trnr	0.25	0.26	0.27	0.26	0.26	0.35
Embedded Tng	0.58	0.56	0.54	0.56	0.58	0.46

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	3.00	1.00	1.00	9.00
Respons	1.00	1.00	1.00	1.00	3.00	9.00
Feedbac	0.33	1.00	1.00	5.00	1.00	9.00
Task Co	1.00	1.00	0.20	1.00	1.00	1.00
Phy Sim	1.00	0.33	1.00	1.00	1.00	1.00
Tng Tim	0.11	0.11	0.11	1.00	1.00	1.00

C = .198

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.24	0.23	0.23	0.12	0.12	0.05

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.58	0.56	0.54	0.56	0.58	0.46

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.06	0.07	0.06	0.05	0.04

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	1.00
Stand Alone Trnr	0.40
Comp Based Instr	0.11
Instr Based Instr	0.00

SME #3

TASK A

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.29	0.28	0.39	0.25	0.69	0.32
Comp Based Instr	0.46	0.47	0.26	0.09	0.20	0.28
Stand Alone Trnr	0.10	0.19	0.10	0.39	0.06	0.24
Embedded Tng	0.15	0.05	0.24	0.27	0.06	0.16

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.33	0.33	1.00	1.00
Respons	1.00	1.00	1.00	0.33	1.00	0.33
Feedbac	3.00	1.00	1.00	0.33	1.00	1.00
Task Co	3.00	3.00	3.00	1.00	1.00	0.33
Phy Sim	1.00	1.00	1.00	1.00	1.00	1.00
Tng Tim	1.00	3.00	1.00	3.00	1.00	1.00

C=.116

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.11	0.11	0.16	0.24	0.15	0.24

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.46	0.47	0.39	0.39	0.69	0.32

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.10	0.05	0.10	0.09	0.06	0.16

Rank Order: Relative Closeness to the Ideal Solution

Instr Based Instr	0.71
Comp Based Instr	0.44
Stand Alone Trnr	0.43
Embedded Tng	0.32

SME # 4

TASK A

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.06	0.06	0.06	0.10	0.11	0.06
Comp Based Instr	0.49	0.25	0.19	0.25	0.23	0.50
Stand Alone Trnr	0.29	0.54	0.11	0.06	0.07	0.14
Embedded Tng	0.16	0.15	0.65	0.58	0.59	0.29

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	5.00	4.00	3.00	5.00
Respons	1.00	1.00	0.25	0.25	0.50	0.25
Feedbac	0.20	4.00	1.00	5.00	5.00	5.00
Task Co	0.25	4.00	0.20	1.00	1.00	3.00
Phy Sim	0.33	2.00	0.20	1.00	1.00	5.00
Tng Tim	0.20	4.00	0.20	0.33	0.20	1.00

C=.237

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.34	0.09	0.27	0.12	0.12	0.07

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.49	0.54	0.65	0.58	0.59	0.50

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.06	0.06	0.06	0.07	0.06

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	0.58
Comp Based Instr	0.56
Stand Alone Trnr	0.35
Instr Based Instr	0.03

SME # 5

TASK A

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.08	0.07	0.07	0.12	0.28	0.07
Comp Based Instr	0.08	0.13	0.15	0.12	0.07	0.12
Stand Alone Trnr	0.42	0.27	0.39	0.47	0.25	0.30
Embedded Tng	0.42	0.53	0.39	0.28	0.41	0.51

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.20	0.33	0.33	0.33
Respons	1.00	1.00	0.20	0.33	1.00	0.33
Feedbac	5.00	5.00	1.00	3.00	3.00	3.00
Task Co	3.00	3.00	0.33	1.00	1.00	1.00
Phy Sim	3.00	1.00	0.33	1.00	1.00	1.00
Tng Tim	3.00	3.00	0.33	1.00	1.00	1.00

C=,026

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.08	0.40	0.16	0.14	0.16

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.42	0.53	0.39	0.47	0.41	0.51

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.08	0.07	0.07	0.12	0.07	0.07

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	0.84
Stand Alone Trnr	0.77
Comp Based Instr	0.19
Instr Based Instr	0.16

SME # 6

TASK A

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.05	0.05	0.05	0.52	0.04	0.07
Comp Based Instr	0.15	0.14	0.14	0.08	0.12	0.15
Stand Alone Trnr	0.35	0.41	0.41	0.20	0.42	0.39
Embedded Tng	0.46	0.41	0.41	0.20	0.42	0.39

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	1.00	0.33	3.00	4.00
Respons	1.00	1.00	1.00	0.33	3.00	4.00
Feedbac	1.00	1.00	1.00	0.33	3.00	4.00
Task Co	3.00	3.00	3.00	1.00	5.00	5.00
Phy Sim	0.33	0.33	0.33	0.20	1.00	3.00
Tng Tim	0.25	0.25	0.25	0.20	0.33	1.00

CI = .031

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.16	0.16	0.16	0.39	0.07	0.04

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.46	0.41	0.41	0.52	0.42	0.39

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.05	0.05	0.05	0.08	0.04	0.07

Rank Order: Relative Closeness to the Ideal Solution

Instr Based Instr	0.61
Embedded Tng	0.49
Stand Alone Trnr	0.47
Comp Based Instr	0.12

SME #1

TASK B

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.04	0.03	0.29	0.04	0.05	0.58
Comp Based Instr	0.12	0.13	0.06	0.11	0.09	0.08
Stand Alone Trnr	0.31	0.29	0.20	0.38	0.34	0.15
Embedded Tng	0.53	0.55	0.44	0.47	0.53	0.19

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.11	0.14	0.14	0.20
Respons	1.00	1.00	0.33	0.20	0.20	0.33
Feedbac	9.00	3.00	1.00	0.33	0.33	0.25
Task Co	7.00	5.00	3.00	1.00	3.00	2.00
Phy Sim	7.00	5.00	3.00	0.33	1.00	1.00
Tng Tim	5.00	3.00	4.00	0.50	1.00	1.00

C=.085

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.04	0.05	0.13	0.35	0.22	0.21

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.53	0.55	0.44	0.47	0.53	0.58

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.04	0.03	0.06	0.04	0.05	0.08

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	0.71
Stand Alone Trnr	0.56
Instr Based Instr	0.37
Comp Based Instr	0.12

SME #2

TASK B

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.04	0.04	0.05	0.04	0.04	0.04
Comp Based Instr	0.11	0.14	0.13	0.14	0.14	0.14
Stand Alone Trnr	0.28	0.32	0.34	0.32	0.35	0.35
Embedded Tng	0.57	0.50	0.48	0.50	0.46	0.46

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	3.00	1.00	1.00	9.00
Respons	1.00	1.00	1.00	1.00	3.00	9.00
Feedbac	0.33	1.00	1.00	5.00	1.00	9.00
Task Co	1.00	1.00	0.20	1.00	1.00	1.00
Phy Sim	1.00	0.33	1.00	1.00	1.00	1.00
Tng Tim	0.11	0.11	0.11	1.00	1.00	1.00

C= .198

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.24	0.23	0.23	0.12	0.12	0.05

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.57	0.50	0.48	0.50	0.46	0.46

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.04	0.04	0.05	0.04	0.04	0.04

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	1.00
Stand Alone Trnr	0.58
Comp Based Instr	0.19
Instr Based Instr	0.00

SME #3

TASK B

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.50	0.50	0.44	0.38	0.49	0.42
Comp Based Instr	0.25	0.25	0.28	0.43	0.23	0.42
Stand Alone Trnr	0.19	0.06	0.05	0.10	0.06	0.08
Embedded Tng	0.06	0.19	0.23	0.09	0.22	0.08

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.33	0.33	1.00	1.00
Respons	1.00	1.00	1.00	0.33	1.00	0.33
Feedbac	3.00	1.00	1.00	0.33	1.00	1.00
Task Co	3.00	3.00	3.00	1.00	1.00	0.33
Phy Sim	1.00	1.00	1.00	1.00	1.00	1.00
Tng Tim	1.00	3.00	1.00	3.00	1.00	1.00

C=.116

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.11	0.11	0.16	0.24	0.15	0.24

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.50	0.50	0.44	0.43	0.49	0.42

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.06	0.05	0.09	0.06	0.08

Rank Order: Relative Closeness to the Ideal Solution

Instr Based Instr	0.93
Comp Based Instr	0.67
Embedded Tng	0.23
Stand Alone Trnr	0.09

SME #4

TASK B

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.05	0.05	0.05	0.13	0.07	0.08
Comp Based Instr	0.57	0.61	0.24	0.27	0.61	0.54
Stand Alone Trnr	0.14	0.13	0.14	0.07	0.12	0.14
Embedded Tng	0.24	0.21	0.58	0.53	0.20	0.24

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	5.00	4.00	3.00	5.00
Respons	1.00	1.00	0.25	0.25	0.50	0.25
Feedbac	0.20	4.00	1.00	5.00	5.00	5.00
Task Co	0.25	4.00	0.20	1.00	1.00	3.00
Phy Sim	0.33	2.00	0.20	1.00	1.00	5.00
Tng Tim	0.20	4.00	0.20	0.33	0.20	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.34	0.09	0.27	0.12	0.12	0.07

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.57	0.61	0.58	0.53	0.61	0.54

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.05	0.05	0.05	0.07	0.07	0.08

Rank Order: Relative Closeness to the Ideal Solution

Comp Based Instr	0.68
Embedded Tng	0.57
Stand Alone Trnr	0.18
Instr Based Instr	0.03

SME #5
TASK B

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.12	0.07	0.07	0.12	0.06	0.09
Comp Based Instr	0.06	0.15	0.13	0.09	0.12	0.20
Stand Alone Trnr	0.26	0.29	0.37	0.40	0.26	0.35
Embedded Tng	0.56	0.49	0.43	0.40	0.56	0.35

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.20	0.33	0.33	0.33
Respons	1.00	1.00	0.20	0.33	1.00	0.33
Feedbac	5.00	5.00	1.00	3.00	3.00	3.00
Task Co	3.00	3.00	0.33	1.00	1.00	1.00
Phy Sim	3.00	1.00	0.33	1.00	1.00	1.00
Tng Tim	3.00	3.00	0.33	1.00	1.00	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.08	0.40	0.16	0.14	0.16

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.56	0.49	0.43	0.40	0.56	0.35

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.07	0.07	0.09	0.06	0.09

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	1.00
Stand Alone Trnr	0.74
Comp Based Instr	0.18
Instr Based Instr	0.03

SITE #1
TASK B

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.13	0.11	0.05	0.31	0.13	0.09
Comp Based Instr	0.16	0.19	0.16	0.13	0.16	0.18
Stand Alone Trnr	0.35	0.29	0.39	0.28	0.35	0.36
Embedded Tng	0.35	0.41	0.39	0.28	0.35	0.36

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	1.00	0.33	3.00	4.00
Respons	1.00	1.00	1.00	0.33	3.00	4.00
Feedbac	1.00	1.00	1.00	0.33	3.00	4.00
Task Co	3.00	3.00	3.00	1.00	5.00	5.00
Phy Sim	0.33	0.33	0.33	0.20	1.00	3.00
Tng Tim	0.25	0.25	0.25	0.20	0.33	1.00

C = .031

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.16	0.16	0.16	0.39	0.07	0.04

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.35	0.41	0.39	0.31	0.35	0.36

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.13	0.11	0.05	0.13	0.13	0.09

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	0.89
Stand Alone Trnr	0.81
Instr Based Instr	0.47
Comp Based Instr	0.19

SME # 1

TASK C

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.04	0.03	0.29	0.04	0.54	0.58
Comp Based Instr	0.12	0.13	0.06	0.11	0.33	0.08
Stand Alone Trnr	0.31	0.29	0.20	0.49	0.08	0.15
Embedded Tng	0.53	0.55	0.44	0.36	0.05	0.19

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim	
Stimuli	1.00	1.00	0.11	0.14	0.14	0.20	
Respons	1.00	1.00	0.33	0.20	0.20	0.33	
Feedbac	9.00	3.00	1.00	0.33	0.33	0.25	CR .095
Task Co	7.00	5.00	3.00	1.00	3.00	2.00	
Phy Sim	7.00	5.00	3.00	0.33	1.00	1.00	
Tng Tim	5.00	3.00	4.00	0.50	1.00	1.00	

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.04	0.05	0.13	0.35	0.22	0.21

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.53	0.55	0.44	0.49	0.54	0.58

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.04	0.03	0.06	0.04	0.05	0.08

Rank Order: Relative Closeness to the Ideal Solution

Stand Alone Trnr	0.54
Embedded Tng	0.49
Instr Based Instr	0.48
Comp Based Instr	0.26

SME # 2

TASK C

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.58	0.58	0.58	0.58	0.58	0.58
Comp Based Instr	0.26	0.26	0.26	0.26	0.26	0.26
Stand Alone Trnr	0.10	0.10	0.10	0.10	0.10	0.10
Embedded Tng	0.06	0.06	0.06	0.06	0.06	0.06

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	3.00	1.00	1.00	9.00
Respons	1.00	1.00	1.00	1.00	3.00	9.00
Feedbac	0.33	1.00	1.00	5.00	1.00	9.00
Task Co	1.00	1.00	0.20	1.00	1.00	1.00
Phy Sim	1.00	0.33	1.00	1.00	1.00	1.00
Tng Tim	0.11	0.11	0.11	1.00	1.00	1.00

C= .198

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.24	0.23	0.23	0.12	0.12	0.05

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.58	0.58	0.58	0.58	0.58	0.58

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.06	0.06	0.06	0.06	0.06

Rank Order: Relative Closeness to the Ideal Solution

Instr Based Instr	1.00
Comp Based Instr	0.38
Stand Alone Trnr	0.08
Embedded Tng	0.00

SME #3

TASK C

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.33	0.31	0.42	0.64	0.05	0.07
Comp Based Instr	0.47	0.40	0.44	0.23	0.05	0.08
Stand Alone Trnr	0.14	0.08	0.07	0.06	0.45	0.39
Embedded Tng	0.06	0.22	0.07	0.08	0.45	0.46

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.33	0.33	1.00	1.00
Respons	1.00	1.00	1.00	0.33	1.00	0.33
Feedbac	3.00	1.00	1.00	0.33	1.00	1.00
Task Co	3.00	3.00	3.00	1.00	1.00	0.33
Phy Sim	1.00	1.00	1.00	1.00	1.00	1.00
Tng Tim	1.00	3.00	1.00	3.00	1.00	1.00

C = .116

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.11	0.11	0.16	0.24	0.15	0.24

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.47	0.40	0.44	0.64	0.45	0.46

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.08	0.07	0.06	0.05	0.07

Rank Order: Relative Closeness to the Ideal Solution

Instr Based Instr	0.56
Embedded Tng	0.44
Comp Based Instr	0.40
Stand Alone Trnr	0.39

SME # 4

TASK C

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.26	0.25	0.19	0.23	0.11	0.11
Comp Based Instr	0.10	0.06	0.13	0.14	0.11	0.11
Stand Alone Trnr	0.05	0.14	0.06	0.13	0.11	0.11
Embedded Tng	0.59	0.55	0.63	0.50	0.67	0.67

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	5.00	4.00	3.00	5.00
Respons	1.00	1.00	0.25	0.25	0.50	0.25
Feedbac	0.20	4.00	1.00	5.00	5.00	5.00
Task Co	0.25	4.00	0.20	1.00	1.00	3.00
Phy Sim	0.33	2.00	0.20	1.00	1.00	5.00
Tng Tim	0.20	4.00	0.20	0.33	0.20	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.34	0.09	0.27	0.12	0.12	0.07

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.59	0.55	0.63	0.50	0.67	0.67

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.05	0.06	0.06	0.13	0.11	0.11

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	1.00
Instr Based Instr	0.31
Comp Based Instr	0.10
Stand Alone Trnr	0.03

SME # 5

TASK C

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.05	0.05	0.12	0.20	0.05	0.25
Comp Based Instr	0.15	0.17	0.13	0.20	0.19	0.13
Stand Alone Trnr	0.35	0.28	0.31	0.40	0.38	0.06
Embedded Tng	0.46	0.51	0.44	0.20	0.33	0.56

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.20	0.33	0.33	0.33
Respons	1.00	1.00	0.20	0.33	1.00	0.33
Feedbac	5.00	5.00	1.00	3.00	3.00	3.00
Task Co	3.00	3.00	0.33	1.00	1.00	1.00
Phy Sim	3.00	1.00	0.33	1.00	1.00	1.00
Tng Tim	3.00	3.00	0.33	1.00	1.00	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.08	0.40	0.16	0.14	0.16

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.46	0.51	0.44	0.40	0.38	0.56

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.05	0.05	0.12	0.20	0.05	0.06

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	0.82
Stand Alone Trnr	0.52
Instr Based Instr	0.15
Comp Based Instr	0.15

SME #6

TASK C

[illegible] Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.25	0.06	0.06	0.20	0.05	[illegible]
Comp Based Instr	0.25	[illegible]	[illegible]	0.20	0.19	[illegible]
Stand Alone Trnr	0.25	0.49	0.42	0.40	0.38	0.35
Embedded Tng	0.25	0.29	[illegible]	0.20	0.38	0.35

[illegible] Eigenvector Pairwise Comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	1.00	0.33	3.00	4.00
Respons	1.00	1.00	1.00	0.33	3.00	4.00
Feedbac	1.00	1.00	1.00	0.33	3.00	4.00
Task Co	3.00	3.00	3.00	1.00	5.00	5.00
Phy Sim	0.33	0.33	0.33	0.20	1.00	3.00
Tng Tim	0.25	0.25	0.25	0.20	0.33	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.16	0.16	0.16	0.39	0.07	0.04

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.25	0.49	0.49	0.40	0.38	0.35

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.25	0.06	0.06	0.20	0.05	0.11

Rank Order: Relative Closeness to the Ideal Solution

Stand Alone Trnr	1.00
Embedded Tng	0.38
Comp Based Instr	0.18
Instr Based Instr	0.00

SME #1

TASK D

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.04	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Comp Based Instr	0.12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Stand Alone Trnr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Embedded Tng	0.53	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.11	0.14	[illegible]	[illegible]
Respons	1.00	1.00	0.33	0.20	[illegible]	[illegible]
Feedbac	9.00	3.00	1.00	0.33	[illegible]	[illegible]
Task Co	7.00	5.00	3.00	1.00	[illegible]	[illegible]
Phy Sim	7.00	5.00	3.00	0.33	[illegible]	1.00
Tng Tim	5.00	3.00	4.00	0.50	[illegible]	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.04	0.05	0.13	0.35	0.22	0.21

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.53	0.55	0.44	0.47	0.53	0.56

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.04	0.03	0.06	0.04	0.05	0.08

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	0.71
Stand Alone Trnr	0.56
Instr Based Instr	0.37
Comp Based Instr	0.12

SME #2

TASK D

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.04	0.05	0.05	0.05	0.05	0.05
Comp Based Instr	0.14	0.13	0.13	0.13	0.13	0.13
Stand Alone Trnr	0.35	0.34	0.34	0.34	0.34	0.34
Embedded Tng	0.46	0.48	0.48	0.48	0.46	0.48

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	3.00	1.00	1.00	9.00
Respons	1.00	1.00	1.00	1.00	3.00	9.00
Feedbac	0.33	1.00	1.00	5.00	1.00	9.00
Task Co	1.00	1.00	0.20	1.00	1.00	1.00
Phy Sim	1.00	0.33	1.00	1.00	1.00	1.00
Tng Tim	0.11	0.11	0.11	1.00	1.00	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.24	0.23	0.23	0.12	0.12	0.05

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.46	0.48	0.48	0.48	0.48	0.48

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.04	0.05	0.05	0.05	0.05	0.05

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	1.00
Stand Alone Trnr	0.69
Comp Based Instr	0.20
Instr Based Instr	0.00

SME #3

TASK D

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.39	0.14	0.36	0.44	0.47	0.35
Comp Based Instr	0.48	0.44	0.44	0.32	0.41	0.46
Stand Alone Trnr	0.06	0.22	0.09	0.09	0.05	0.14
Embedded Tng	0.06	0.21	0.12	0.15	0.06	0.05

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.33	0.33	1.00	1.00
Respons	1.00	1.00	1.00	0.33	1.00	0.33
Feedbac	3.00	1.00	1.00	0.33	1.00	1.00
Task Co	3.00	3.00	3.00	1.00	1.00	0.33
Phy Sim	1.00	1.00	1.00	1.00	1.00	1.00
Tng Tim	1.00	3.00	1.00	3.00	1.00	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.11	0.11	0.16	0.24	0.15	0.24

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.48	0.44	0.44	0.44	0.47	0.46

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.14	0.09	0.09	0.05	0.05

Rank Order: Relative Closeness to the Ideal Solution

Comp Based Instr	0.83
Instr Based Instr	0.75
Stand Alone Trnr	0.13
Embedded Tng	0.10

SME #4

TASK D

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.25	0.18	0.22	0.13	0.13	0.16
Comp Based Instr	0.13	0.13	0.12	0.13	0.13	0.16
Stand Alone Trnr	0.06	0.09	0.08	0.13	0.13	0.07
Embedded Tng	0.56	0.61	0.59	0.63	0.63	0.60

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	5.00	4.00	3.00	5.00
Respons	1.00	1.00	0.25	0.25	0.50	0.25
Feedbac	0.20	4.00	1.00	5.00	5.00	5.00
Task Co	0.25	4.00	0.20	1.00	1.00	3.00
Phy Sim	0.33	2.00	0.20	1.00	1.00	5.00
Tng Tim	0.20	4.00	0.20	0.33	0.20	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.34	0.09	0.27	0.12	0.12	0.07

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.56	0.61	0.59	0.63	0.63	0.60

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.09	0.08	0.13	0.13	0.07

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	1.00
Instr Based Instr	0.31
Comp Based Instr	0.11
Stand Alone Trnr	0.00

SME #5
TASK D

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.22	0.12	0.06	0.05	0.05	0.08
Comp Based Instr	0.12	0.13	0.16	0.09	0.06	0.08
Stand Alone Trnr	0.08	0.31	0.49	0.34	0.47	0.42
Embedded Tng	0.59	0.44	0.29	0.53	0.41	0.42

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.20	0.33	0.33	0.33
Respons	1.00	1.00	0.20	0.33	1.00	0.33
Feedbac	5.00	5.00	1.00	3.00	3.00	3.00
Task Co	3.00	3.00	0.33	1.00	1.00	1.00
Phy Sim	3.00	1.00	0.33	1.00	1.00	1.00
Tng Tim	3.00	3.00	0.33	1.00	1.00	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.08	0.40	0.16	0.14	0.16

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.59	0.44	0.49	0.53	0.47	0.42

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.08	0.12	0.06	0.05	0.05	0.08

Rank Order: Relative Closeness to the Ideal Solution

Stand Alone Trnr	0.82
Embedded Tng	0.64
Comp Based Instr	0.19
Instr Based Instr	0.04

SME #6

TASK O

[illegible] Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.05	0.05	0.05	[illegible]	[illegible]	[illegible]
Comp Based Instr	0.19	0.19	0.19	[illegible]	[illegible]	[illegible]
Stand Alone Trnr	0.38	0.38	0.38	[illegible]	[illegible]	[illegible]
Embedded Tng	0.38	0.38	0.38	[illegible]	[illegible]	[illegible]

[illegible] Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
timuli	1.00	1.00	1.00	0.33	3.00	4.00
espons	1.00	1.00	1.00	0.33	3.00	4.00
eedbac	1.00	1.00	1.00	0.33	3.00	4.00
ask Co	3.00	3.00	3.00	1.00	5.00	5.00
hy Sim	0.33	0.33	0.33	0.20	1.00	3.00
ng Tim	0.25	0.25	0.25	0.20	0.33	1.00

he DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.16	0.16	0.16	0.39	0.07	0.04

he Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.38	0.38	0.38	0.38	0.38	0.37

he Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.05	0.05	0.05	0.05	0.05	0.07

ank Order: Relative Closeness to the Ideal Solution

Stand Alone Trnr	1.00
Embedded Tng	1.00
Comp Based Instr	0.42
Instr Based Instr	0.00

SME #1
TASK E

[illegible] Matrix

	Stimuli	[illegible]	Feedbac	[illegible]	[illegible]	[illegible]
Instr [illegible]	0.04	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

	[illegible]	[illegible]	[illegible]	Task Co	[illegible]	Tng Tim
imuli	[illegible]	1.00	[illegible]	0.14	0.14	0.20
espons	1.00	1.00	0.33	0.20	0.20	0.33
edbac	9.00	3.00	1.00	0.33	0.33	0.25
sk Co	7.00	5.00	3.00	1.00	3.00	2.00
Sim	7.00	5.00	3.00	0.33	1.00	1.00
Tim	5.00	3.00	4.00	0.50	1.00	1.00

e DM subjective weights

imuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.04	0.05	0.13	0.35	0.22	0.21

he Ideal Solution

imuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.55	0.51	0.53	0.47	0.53	0.58

he Negative-Ideal Solution

imuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.04	0.05	0.04	0.04	0.05	0.07

ank Order: Relative Closeness to the Ideal Solution

Embedded Tng	0.65
Stand Alone Trnr	0.56
Instr Based Instr	0.35
Comp Based Instr	0.18

SME #2

TASK E

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.04	0.04	0.04	0.04	0.04	0.04
Comp Based Instr	0.14	0.14	0.14	0.14	0.14	0.14
Stand Alone Trnr	0.35	0.35	0.35	0.35	0.35	0.35
Embedded Tng	0.46	0.46	0.46	0.46	0.46	0.46

The Eigenvector Pairwise comparisons

	Stimuli	**Respons**	**Feedbac**	**Task Co**	**Phy Sim**	**Tng Tim**
Stimuli	1.00	1.00	3.00	1.00	1.00	9.00
Respons	1.00	1.00	1.00	1.00	3.00	9.00
Feedbac	0.33	1.00	1.00	5.00	1.00	9.00
Task Co	1.00	1.00	0.20	1.00	1.00	1.00
Phy Sim	1.00	0.33	1.00	1.00	1.00	1.00
Tng Tim	0.11	0.11	0.11	1.00	1.00	1.00

The DM subjective weights

Stimuli	**Respons**	**Feedbac**	**Task Co**	**Phy Sim**	**Tng Tim**
0.24	0.23	0.23	0.12	0.12	0.05

The Ideal Solution

Stimuli	**Respons**	**Feedbac**	**Task Co**	**Phy Sim**	**Tng Tim**
0.46	0.46	0.46	0.46	0.46	0.46

The Negative-Ideal Solution

Stimuli	**Respons**	**Feedbac**	**Task Co**	**Phy Sim**	**Tng Tim**
0.04	0.04	0.04	0.04	0.04	0.04

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	1.00
Stand Alone Trnr	0.74
Comp Based Instr	0.24
Instr Based Instr	0.00

SME # 3
TASK E

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.05	0.30	0.14	0.12	0.05	0.45
Comp Based Instr	0.05	0.47	0.44	0.28	0.06	0.25
Stand Alone Trnr	0.45	0.12	0.22	0.23	0.47	0.05
Embedded Tng	0.45	0.12	0.21	0.37	0.41	0.24

The Eigenvector Pairwise comparisons

	Stimuli	**Respons**	**Feedbac**	**Task Co**	**Phy Sim**	**Tng Tim**
Stimuli	1.00	1.00	0.33	0.33	1.00	1.00
Respons	1.00	1.00	1.00	0.33	1.00	0.33
Feedbac	3.00	1.00	1.00	0.33	1.00	1.00
Task Co	3.00	3.00	3.00	1.00	1.00	0.33
Phy Sim	1.00	1.00	1.00	1.00	1.00	1.00
Tng Tim	1.00	3.00	1.00	3.00	1.00	1.00

The DM subjective weights

Stimuli	**Respons**	**Feedbac**	**Task Co**	**Phy Sim**	**Tng Tim**
0.11	0.11	0.16	0.24	0.15	0.24

The Ideal Solution

Stimuli	**Respons**	**Feedbac**	**Task Co**	**Phy Sim**	**Tng Tim**
0.45	0.47	0.44	0.37	0.47	0.45

The Negative-Ideal Solution

Stimuli	**Respons**	**Feedbac**	**Task Co**	**Phy Sim**	**Tng Tim**
0.05	0.12	0.14	0.12	0.05	0.05

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	0.58
Comp Based Instr	0.51
Instr Based Instr	0.47
Stand Alone Trnr	0.40

SITE # 4
TASK E

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.06	0.05	0.05	0.22	0.05	0.05
Comp Based Instr	0.41	0.11	0.21	0.11	0.14	0.21
Stand Alone Trnr	0.41	0.24	0.13	0.51	0.61	0.61
Embedded Tng	0.13	0.60	0.61	0.17	0.20	0.13

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	5.00	4.00	3.00	5.00
Respons	1.00	1.00	0.25	0.25	0.50	0.25
Feedbac	0.20	4.00	1.00	5.00	5.00	5.00
Task Co	0.25	4.00	0.20	1.00	1.00	3.00
Phy Sim	0.33	2.00	0.20	1.00	1.00	5.00
Tng Tim	0.20	4.00	0.20	0.33	0.20	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.34	0.09	0.27	0.12	0.12	0.07

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.41	0.60	0.61	0.51	0.61	0.61

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.05	0.05	0.11	0.05	0.05

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	0.56
Stand Alone Trnr	0.55
Comp Based Instr	0.49
Instr Based Instr	0.06

SME #5
TASK E

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.08	0.07	0.07	0.05	0.07	0.05
Comp Based Instr	0.08	0.15	0.15	0.05	0.19	0.19
Stand Alone Trnr	0.42	0.29	0.39	0.45	0.37	0.38
Embedded Tng	0.42	0.49	0.39	0.45	0.37	0.36

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.20	0.33	0.33	0.33
Respons	1.00	1.00	0.20	0.33	1.00	0.33
Feedbac	5.00	5.00	1.00	3.00	3.00	3.00
Task Co	3.00	3.00	0.33	1.00	1.00	1.00
Phy Sim	3.00	1.00	0.33	1.00	1.00	1.00
Tng Tim	3.00	3.00	0.33	1.00	1.00	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.08	0.40	0.16	0.14	0.16

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.42	0.49	0.39	0.45	0.37	0.38

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.08	0.07	0.07	0.05	0.07	0.05

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	1.00
Stand Alone Trnr	0.92
Comp Based Instr	0.26
Instr Based Instr	0.00

SME #6
TASK E

[illegible]

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Comp Based Instr	[illegible]	[illegible]	0.05	[illegible]	[illegible]	[illegible]
Instr Based Instr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Stand Alone Trnr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Embedded Tng	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The Eigenvector Pairwise Comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	1.00	0.33	3.00	4.00
Respons	1.00	1.00	1.00	0.33	3.00	4.00
Feedbac	1.00	1.00	1.00	0.33	3.00	4.00
Task Co	3.00	3.00	3.00	1.00	5.00	5.00
Phy Sim	0.33	0.33	0.33	0.20	1.00	3.00
Tng Tim	0.25	0.25	0.25	0.20	0.33	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.16	0.16	0.16	0.39	0.07	0.04

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.38	0.38	0.38	0.37	0.37	0.37

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.05	0.05	0.05	0.07	0.07	0.07

Rank Order: Relative Closeness to the Ideal Solution

Stand Alone Trnr	1.00
Embedded Tng	1.00
Comp Based Instr	0.41
Instr Based Instr	0.00

SME #1
TASK F

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Comp Based Instr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Stand Alone Trnr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Embedded Tng	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The Eigenvector Pairwise Comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	[illegible]	1.00	0.11	0.14	[illegible]	[illegible]
Respons	1.00	1.00	0.33	[illegible]	[illegible]	[illegible]
Feedbac	9.00	3.00	1.00	0.33	[illegible]	[illegible]
Task Co	7.00	5.00	3.00	1.00	3.00	[illegible]
Phy Sim	7.00	5.00	3.00	0.33	1.00	[illegible]
Tng Tim	5.00	3.00	4.00	0.50	1.00	[illegible]

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.04	0.05	0.13	0.35	0.22	0.21

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.53	0.55	0.44	0.47	0.53	0.58

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.04	0.03	0.12	0.04	0.05	0.09

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	0.71
Stand Alone Trnr	0.57
Instr Based Instr	0.35
Comp Based Instr	0.12

SME # ~~1~~ 2
TASK F

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.05	0.05	0.05	0.05	0.05	0.05
Comp Based Instr	0.13	0.13	0.13	0.13	0.13	0.13
Stand Alone Trnr	0.34	0.34	0.34	0.34	0.34	0.34
Embedded Tng	0.48	0.48	0.48	0.48	0.48	0.48

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	3.00	1.00	1.00	9.00
Respons	1.00	1.00	1.00	1.00	3.00	9.00
Feedbac	0.33	1.00	1.00	5.00	1.00	9.00
Task Co	1.00	1.00	0.20	1.00	1.00	1.00
Phy Sim	1.00	0.33	1.00	1.00	1.00	1.00
Tng Tim	0.11	0.11	0.11	1.00	1.00	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.24	0.23	0.23	0.12	0.12	0.05

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.48	0.48	0.48	0.48	0.48	0.48

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.05	0.05	0.05	0.05	0.05	0.05

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	1.00
Stand Alone Trnr	0.67
Comp Based Instr	0.19
Instr Based Instr	0.00

SME # 3
TASK F

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.05	0.05	0.05	0.44	0.05	0.22
Comp Based Instr	0.05	0.05	0.05	0.23	0.05	0.24
Stand Alone Trnr	0.45	0.45	0.45	0.17	0.45	0.27
Embedded Tng	0.45	0.45	0.45	0.16	0.45	0.27

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.33	0.33	1.00	1.00
Respons	1.00	1.00	1.00	0.33	1.00	0.33
Feedbac	3.00	1.00	1.00	0.33	1.00	1.00
Task Co	3.00	3.00	3.00	1.00	1.00	0.33
Phy Sim	1.00	1.00	1.00	1.00	1.00	1.00
Tng Tim	1.00	3.00	1.00	3.00	1.00	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.11	0.11	0.16	0.24	0.15	0.24

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.45	0.45	0.45	0.44	0.45	0.27

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.05	0.05	0.05	0.16	0.05	0.22

Rank Order: Relative Closeness to the Ideal Solution

Stand Alone Trnr	0.59
Embedded Tng	0.58
Instr Based Instr	0.42
Comp Based Instr	0.14

SME #4
TASK F

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.05	0.05	0.05	0.07	0.06	0.06
Comp Based Instr	0.61	0.61	0.63	0.60	0.58	0.65
Stand Alone Trnr	0.17	0.17	0.16	0.16	0.18	0.14
Embedded Tng	0.17	0.17	0.16	0.16	0.18	0.15

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	5.00	4.00	3.00	5.00
Respons	1.00	1.00	0.25	0.25	0.50	0.25
Feedbac	0.20	4.00	1.00	5.00	5.00	5.00
Task Co	0.25	4.00	0.20	1.00	1.00	3.00
Phy Sim	0.33	2.00	0.20	1.00	1.00	5.00
Tng Tim	0.20	4.00	0.20	0.33	0.20	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.34	0.09	0.27	0.12	0.12	0.07

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.61	0.61	0.63	0.60	0.58	0.65

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.05	0.05	0.05	0.07	0.06	0.06

Rank Order: Relative Closeness to the Ideal Solution

Comp Based Instr	1.00
Embedded Tng	0.20
Stand Alone Trnr	0.20
Instr Based Instr	0.00

SME #5
TASK F

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.41	0.12	0.06	0.13	0.05	0.12
Comp Based Instr	0.41	0.09	0.12	0.27	0.14	0.12
Stand Alone Trnr	0.07	0.40	0.26	0.07	0.61	0.47
Embedded Tng	0.12	0.40	0.56	0.53	0.20	0.28

The Eigenvector Pairwise *comparisons*

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.20	0.33	0.33	0.33
Respons	1.00	1.00	0.20	0.33	1.00	0.33
Feedbac	5.00	5.00	1.00	3.00	3.00	3.00
Task Co	3.00	3.00	0.33	1.00	1.00	1.00
Phy Sim	3.00	1.00	0.33	1.00	1.00	1.00
Tng Tim	3.00	3.00	0.33	1.00	1.00	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.08	0.40	0.16	0.14	0.16

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.41	0.40	0.56	0.53	0.61	0.47

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.07	0.09	0.06	0.07	0.05	0.12

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	0.77
Stand Alone Trnr	0.47
Comp Based Instr	0.19
Instr Based Instr	0.09

SME # 6
TASK F

he Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.25	0.14	[illegible]	[illegible]	[illegible]	[illegible]
Comp Based Instr	0.25	0.29	0.29	[illegible]	[illegible]	[illegible]
Stand Alone Trnr	0.25	0.29	0.29	[illegible]	[illegible]	[illegible]
Embedded Tng	0.25	[illegible]	0.29	[illegible]	[illegible]	[illegible]

he Eigenvector Pairwise Comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
timuli	1.00	1.00	[illegible]	0.33	3.00	4.00
espons	1.00	1.00	1.00	0.33	3.00	4.00
eedbac	1.00	1.00	1.00	0.33	3.00	4.00
ask Co	3.00	3.00	3.00	1.00	5.00	5.00
hy Sim	0.33	0.33	0.33	0.20	1.00	3.00
ng Tim	0.25	0.25	0.25	0.20	0.33	1.00

he DM subjective weights

timuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.15	0.16	0.16	0.39	0.07	0.04

he Ideal Solution

timuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.25	0.29	0.29	0.29	0.31	0.25

he Negative-Ideal Solution

timuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.25	0.14	0.14	0.14	0.08	0.25

ank Order: Relative Closeness to the Ideal Solution

Stand Alone Trnr	1.00
Comp Based Instr	1.00
Embedded Tng	1.00
Instr Based Instr	1.00

SME #1
TASK 6

[illegible] Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Comp Based Instr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Stand Alone Trnr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Embedded Tng	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The Eigenvector Pairwise Comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.11	0.14	0.14	0.[illegible]
Respons	1.00	1.00	0.33	0.20	0.20	0.33
Feedbac	9.00	7.00	1.00	0.33	0.33	0.25
Task Co	7.00	5.00	3.00	1.00	3.00	2.[illegible]
Phy Sim	7.00	5.00	3.00	0.33	1.00	1.00
Tng Tim	5.00	3.00	4.00	0.50	1.00	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.04	0.05	0.13	0.35	0.22	0.21

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.55	0.51	0.53	0.47	0.53	0.58

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.04	0.05	0.04	0.04	0.05	0.07

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	0.65
Stand Alone Trnr	0.56
Instr Based Instr	0.35
Comp Based Instr	[illegible]

SME #2

TASK 6

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.05	0.05	0.05	0.05	0.05	0.05
Comp Based Instr	0.13	0.13	0.13	0.13	0.13	0.13
Stand Alone Trnr	0.34	0.34	0.34	0.34	0.34	0.34
Embedded Tng	0.48	0.48	0.48	0.48	0.48	0.48

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	3.00	1.00	1.00	9.00
Respons	1.00	1.00	1.00	1.00	3.00	9.00
Feedbac	0.33	1.00	1.00	5.00	1.00	9.00
Task Co	1.00	1.00	0.20	1.00	1.00	1.00
Phy Sim	1.00	0.33	1.00	1.00	1.00	1.00
Tng Tim	0.11	0.11	0.11	1.00	1.00	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.24	0.23	0.23	0.12	0.12	0.05

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.48	0.48	0.48	0.48	0.48	0.48

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.05	0.05	0.05	0.05	0.05	0.05

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	1.00
Stand Alone Trnr	0.67
Comp Based Instr	0.19
Instr Based Instr	0.00

SME #3
TASK 6

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.41	0.10	0.40	0.05	0.05	0.44
Comp Based Instr	0.41	0.17	0.40	0.05	0.05	0.35
Stand Alone Trnr	0.07	0.27	0.10	0.45	0.45	0.09
Embedded Tng	0.12	0.46	0.10	0.45	0.45	0.11

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.33	0.33	1.00	1.00
Respons	1.00	1.00	1.00	0.33	1.00	0.33
Feedbac	3.00	1.00	1.00	0.33	1.00	1.00
Task Co	3.00	3.00	3.00	1.00	1.00	0.33
Phy Sim	1.00	1.00	1.00	1.00	1.00	1.00
Tng Tim	1.00	3.00	1.00	3.00	1.00	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.11	0.11	0.16	0.24	0.15	0.24

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.41	0.46	0.40	0.45	0.45	0.44

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.07	0.10	0.10	0.05	0.05	0.09

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	0.53
Stand Alone Trnr	0.49
Instr Based Instr	0.49
Comp Based Instr	0.45

SME #4

TASK 6

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.06	0.07	0.06	0.05	0.06	0.06
Comp Based Instr	0.46	0.57	0.58	0.56	0.60	0.58
Stand Alone Trnr	0.32	0.12	0.18	0.20	0.17	0.18
Embedded Tng	0.16	0.24	0.18	0.18	0.16	0.18

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	5.00	4.00	3.00	5.00
Respons	1.00	1.00	0.25	0.25	0.50	0.25
Feedbac	0.20	4.00	1.00	5.00	5.00	5.00
Task Co	0.25	4.00	0.20	1.00	1.00	3.00
Phy Sim	0.33	2.00	0.20	1.00	1.00	5.00
Tng Tim	0.20	4.00	0.20	0.33	0.20	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.34	0.09	0.27	0.12	0.12	0.07

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.46	0.57	0.58	0.56	0.60	0.58

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.07	0.06	0.05	0.06	0.06

Rank Order: Relative Closeness to the Ideal Solution

Comp Based Instr	1.00
Stand Alone Trnr	0.42
Embedded Tng	0.24
Instr Based Instr	0.00

SME # 5

TASK 6

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.12	0.04	0.07	0.04	0.05	0.07
Comp Based Instr	0.06	0.11	0.15	0.11	0.13	0.12
Stand Alone Trnr	0.26	0.38	0.39	0.38	0.34	0.30
Embedded Tng	0.56	0.47	0.39	0.47	0.48	0.51

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.20	0.33	0.33	0.33
Respons	1.00	1.00	0.20	0.33	1.00	0.33
Feedbac	5.00	5.00	1.00	3.00	3.00	3.00
Task Co	3.00	3.00	0.33	1.00	1.00	1.00
Phy Sim	3.00	1.00	0.33	1.00	1.00	1.00
Tng Tim	3.00	3.00	0.33	1.00	1.00	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.08	0.40	0.16	0.14	0.16

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.56	0.47	0.39	0.47	0.48	0.51

The Negative Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.04	0.07	0.04	0.05	0.07

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	1.00
Stand Alone Trnr	0.77
Comp Based Instr	0.21
Instr Based Instr	0.02

SME #6
TASK 6

[illegible] Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Comp Based Instr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Stand Alone Trnr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Embedded Tng	[illegible]	[illegible]	0.36	[illegible]	[illegible]	[illegible]

[illegible] Pairwise Comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	[illegible]	[illegible]	1.00	0.33	3.00	4.00
Respons	1.00	1.00	1.00	0.33	3.00	4.00
Feedbac	1.00	1.00	1.00	0.33	3.00	4.00
Task Co	3.00	3.00	3.00	1.00	5.00	5.00
Phy Sim	0.33	0.33	0.33	0.20	1.00	3.00
Tng Tim	0.25	0.25	0.25	0.20	0.33	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.16	0.16	0.16	0.39	0.07	0.04

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phv Sim	Tng Tim
0.38	0.38	0.38	0.38	0.38	0.37

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.05	0.05	0.05	0.05	0.05	0.07

Rank Order: Relative Closeness to the Ideal Solution

Stand Alone Trnr	1.00
Embedded Tng	1.00
Comp Based Instr	0.42
Instr Based Instr	0.00

SME #1

TASK H

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Instr Based Instr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Comp Based Instr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Stand Alone Trnr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Embedded Tng	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The Eigenvector Pairwise Comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	[illegible]	[illegible]	[illegible]	[illegible]
Respons	1.00	1.00	0.33	[illegible]	[illegible]	[illegible]
Feedbac	[illegible]	3.00	[illegible]	[illegible]	[illegible]	[illegible]
Task Co	7.00	5.00	3.00	1.00	[illegible]	[illegible]
Phy Sim	7.00	5.00	[illegible]	0.33	[illegible]	[illegible]
Tng Tim	5.00	3.00	4.00	0.50	[illegible]	[illegible]

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.04	0.05	0.13	0.35	0.22	0.21

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.55	0.51	0.53	0.47	0.53	0.58

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.04	0.05	0.04	0.04	0.05	0.07

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	0.65
Stand Alone Trnr	0.56
Instr Based Instr	0.35
Comp Based Instr	0.19

SME #2
TASK H

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.05	0.05	0.05	0.05	0.05	0.05
Comp Based Instr	0.13	0.13	0.13	0.13	0.13	0.13
Stand Alone Trnr	0.34	0.34	0.34	0.34	0.34	0.34
Embedded Tng	0.48	0.48	0.48	0.48	0.48	0.48

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	3.00	1.00	1.00	9.00
Respons	1.00	1.00	1.00	1.00	3.00	9.00
Feedbac	0.33	1.00	1.00	5.00	1.00	9.00
Task Co	1.00	1.00	0.20	1.00	1.00	1.00
Phy Sim	1.00	0.33	1.00	1.00	1.00	1.00
Tng Tim	0.11	0.11	0.11	1.00	1.00	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.24	0.23	0.23	0.12	0.12	0.05

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.48	0.48	0.48	0.48	0.48	0.48

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.05	0.05	0.05	0.05	0.05	0.05

Rank Order: Relative Closeness to the Ideal Solution

Embedded Tng	1.00
Stand Alone Trnr	0.67
Comp Based Instr	0.19
Instr Based Instr	0.00

SME #3
TASK H

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.05	0.05	0.45	0.05	0.05	0.05
Comp Based Instr	0.05	0.05	0.35	0.19	0.05	0.05
Stand Alone Trnr	0.45	0.45	0.10	0.47	0.45	0.45
Embedded Tng	0.45	0.45	0.10	0.28	0.45	0.45

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.33	0.33	1.00	1.00
Respons	1.00	1.00	1.00	0.33	1.00	0.33
Feedbac	3.00	1.00	1.00	0.33	1.00	1.00
Task Co	3.00	3.00	3.00	1.00	1.00	0.33
Phy Sim	1.00	1.00	1.00	1.00	1.00	1.00
Tng Tim	1.00	3.00	1.00	3.00	1.00	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.11	0.11	0.16	0.24	0.15	0.24

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.45	0.45	0.45	0.47	0.45	0.45

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.05	0.05	0.10	0.05	0.05	0.05

Rank Order: Relative Closeness to the Ideal Solution

Stand Alone Trnr	0.73
Embedded Tng	0.64
Comp Based Instr	0.28
Instr Based Instr	0.27

SME #4

TASK H

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.06	0.05	0.05	0.22	0.05	0.05
Comp Based Instr	0.56	0.11	0.21	0.11	0.14	0.14
Stand Alone Trnr	0.25	0.24	0.13	0.51	0.61	0.61
Embedded Tng	0.12	0.60	0.61	0.17	0.20	0.2[illegible]

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	5.00	4.00	3.00	5.00
Respons	1.00	1.00	0.25	0.25	0.50	0.25
Feedbac	0.20	4.00	1.00	5.00	5.00	5.00
Task Co	0.25	4.00	0.20	1.00	1.00	3.00
Phy Sim	0.33	2.00	0.20	1.00	1.00	5.00
Tng Tim	0.20	4.00	0.20	0.33	0.20	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.34	0.09	0.27	0.12	0.12	0.07

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.56	0.60	0.61	0.51	0.61	0.61

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.05	0.05	0.11	0.05	0.05

Rank Order: Relative Closeness to the Ideal Solution

Comp Based Instr	0.56
Embedded Tng	0.49
Stand Alone Trnr	0.41
Instr Based Instr	0.05

SME #5
TASK H

The Decision Matrix

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Instr Based Instr	0.44	0 05	0.05	0.05	0.07	0.09
Comp Based Instr	0.23	0.19	0.14	0.13	0.13	0.20
Stand Alone Trnr	0.17	0.38	0.61	0.34	0.27	0 35
Embedded Tng	0.16	0.38	0.20	0.48	0 53	0 35

The Eigenvector Pairwise comparisons

	Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
Stimuli	1.00	1.00	0.20	0.33	0.33	0.33
Respons	1.00	1.00	0.20	0.33	1.00	0.33
Feedbac	5.00	5.00	1.00	3.00	3.00	3.00
Task Co	3.00	3.00	0.33	1.00	1.00	1.00
Phy Sim	3.00	1.00	0.33	1.00	1.00	1.00
Tng Tim	3.00	3.00	0.33	1.00	1.00	1.00

The DM subjective weights

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.06	0.08	0.40	0.16	0.14	0.16

The Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.44	0.38	0.61	0.48	0.53	0.35

The Negative-Ideal Solution

Stimuli	Respons	Feedbac	Task Co	Phy Sim	Tng Tim
0.16	0.05	0.05	0.05	0.07	0.09

Rank Order: Relative Closeness to the Ideal Solution

Stand Alone Trnr	0.83
Embedded Tng	0.45
Comp Based Instr	0.18
Instr Based Instr	0.07

SME # 6

TASK H

APPENDIX F: BORDA AGGREGATE RANKINGS

This appendix provides the aggregate rankings of the six individual subject matter experts for each of the eight tasks.

Task A: Perform Before Operations Checks and Services

Task B: Troubleshoot the Fire Control System

Task C: Evacuate a Wounded Crewman

Task D: Replace a Thrown Track

Task E: Engage Targets with the Main Gun from the Gunner's Station

Task F: Adjust Crew Compartment Pressurization

Task G: Zero the Machinegun

Task H: Engage Targets with the Coax from the Gunner's Station

[illegible]

TASK A

Option Name	Points	Rank
Embedded Tng	14	1
Stand Alone Trnr	9	2
Instr Based Instr	7	3
Comp Based Instr	6	4

TASK B

Option Name	Points	Rank
Embedded Tng	14	1
Stand Alone Trnr	8	2
Instr Based Instr	7	3
Comp Based Instr	7	4

TASK C

Option Name	Points	Rank
Embedded Tng	13	1
Instr Based Instr	11	2
Stand Alone Trnr	8	3
Comp Based Instr	4	4

TASK D

Option Name	Points	Rank
Embedded Tng	13	1
Stand Alone Trnr	11	2
Comp Based Instr	7	3
Instr Based Instr	5	4

TASK E

Option Name	Points	Rank
Embedded Tng	17	1
Stand Alone Trnr	10	2
Comp Based Instr	6	3
Instr Based Instr	2	4

TASK F

Option Name	Points	Rank
Embedded Tng	15	1
Stand Alone Trnr	12	2
Comp Based Instr	6	3
Instr Based Instr	2	4

TASK G

Option Name	Points	Rank
Embedded Tng	14	1
Stand Alone Trnr	11	2
Comp Based Instr	6	3
Instr Based Instr	2	4

TASK H

Option Name	Points	Rank
Embedded Tng	14	1
Stand Alone Trnr	13	2
Comp Based Instr	7	3
Instr Based Instr	1	4

APPENDIX G. CONSISTENCY INDEX DATA ANALYSIS.

.037	.163	.113	.152
.054	.12	1.82	.79
.054	.082	.553	.079
.016	.051	.553	.106
.051	.11	1.03	.058
.016	.219	.012	.128
.037	.255	.787	.045
.054	.12	0	.192
.054	.082	.159	.131
.016	.113	.509	.128
.051	.169	.078	.054
.016	.275	.205	.163
.008	.163	0	.128
.026	.12	.016	.39
.028	.082	.012	.278
.008	.051	.509	.347
.028	.169	.04	.25
0	.275	.128	.158
0	.163	.016	.188
.007	.12	.295	0
.007	.082	0	.075
0	.051	.039	.016
.001	.053	.509	.057
.004	.044	.395	.07
0	.016	.016	.118
0	.044	1.129	.044
0	.029	0	.074
0	.086	0	.043
0	.121	0	.012
.002	.128	.097	.144
0	.064	0	.131
0	.128	2.03	.037
0	.086	.059	.275
.002	.086	.117	.255
.002	.064	.024	0
.002	.064	0	.001
0	.064	0	.3
0	.064	.035	.081
0	.064	0	.255
0	.064	0	.007
0	.086	.012	.082
.002	.064	.654	.016
0	.064	0	0
0	.064	0	0
0	.064	.342	.074
0	.064	.4	.016
0	.086	.16	0
.002	.086	.189	.002
.11	.086	.194	0
.219	.086	.124	.059
.095	.086	.116	.012
.12	.086	.152	.044
.082	.064	.179	.075
.014	.064	.075	.188
.11	.064	.126	.057
.219	.064	.076	.044
.095	.064	.304	.12
.12	.064	.384	.016
.082	.064	.127	.12
.113	.064	.158	.064
.11	.064	.005	.118
.219	.064	.005	.097
.095	.064	.3	.001
.231	.064	.046	.199
.079	.064	.081	.125
.113	.064	0	.054
.11	.064	0	.075
.219	.064	.058	.31
.095	.064	.209	.031
.12	.064	.278	.085
.082	[illegible]	.347	.98
.13	.654	.25	[illegible]
.59	.519	.188	.307
.275	.538		

S U M M A R Y   S T A T I S T I C S

NUMBER OF VALUES = 294
ARITHMETIC MEAN = .124939
STANDARD DEVIATION = .21161
VARIANCE = 4.47788E-2

IF THE DATA IS CONSIDERED TO BE A SAMPLE OF A POPULATION, THE FOLLOWING CAN BE INFERRED ABOUT THE POPULATION:

ESTIMATED STANDARD DEVIATION OF THE POPULATION = .211971
ESTIMATED POPULATION VARIANCE = 4.49316E-2
STANDARD ERROR OF THE MEAN = 1.23624E-2

CONFIDENCE LIMITS ON POPULATION MEAN:

CONF LEVEL	LOWER LIMIT	UPPER LIMIT
50	.116601	.133277
75	.110718	.13916
90	.104604	.145273
95.	.100709	.149169
99.	.093095	.156783
99.9	8.42597E-2	.165618
99.99	7.68409E-2	.173037
99.999	7.03324E-2	.179545

O R D E R   S T A T I S T I C S

SMALLEST VARIATE = 0
LOWER DECILE = 0
FIRST QUARTILE = .016
MEDIAN = .064
MODE = 0
THIRD QUARTILE = .128
UPPER DECILE = .275
LARGEST VARIATE = 2.03

TOTAL RANGE = 2.03
DECILE RANGE = .275
SEMI-QUARTILE RANGE = .112
PEARSON SKEWNESS = .864

DO YOU WISH TO SPECIFY ANOTHER CLASS INTERVAL ? yes
PLEASE SPECIFY LOWER AND UPPER LIMITS FOR ANY TYPICAL CLASS INTERVAL, I.E., FOR A TEN UNIT INTERVAL FROM 100 TO 110, INPUT '100,110'.
? .0,.1

F R E Q U E N C Y   D I S T R I B U T I O N

FROM	UP TO BUT NOT INCLUDING	FREQUENCY	PERCENT FREQUENCY
-.2	-.1	0	0
-.1	4.44089E-16	0	0
4.44089E-16	.1	187	63.605
.1	.2	62	21.088
.2	.3	20	6.803
.3	.4	10	3.401
.4	.5	1	.34
.5	.6	5	1.701
.6	.7	4	1.361
.7	.8	1	.34
.8	.9	0	0
.9	1.	0	0
1.	1.1	1	.34
1.1	1.2	1	.34
1.2	1.3	0	0
1.3	1.4	0	0
1.4	1.5	0	0
1.5	1.6	0	0
1.6	1.7	0	0
1.7	1.8	0	0
1.8	1.9	1	.34
1.9	2.	0	0
2.	1.05	1	.34
1.05	2.2	0	0
2.2	1.15	0	0

DO YOU WISH TO SPECIFY ANOTHER CLASS INTERVAL ? no

? .0,.05

F R E Q U E N C Y   D I S T R I B U T I O N

FROM	UP TO BUT NOT INCLUDING	FREQUENCY	PERCENT FREQUENCY
-.1	-.05	0	0
-.05	2.22045E-16	0	0
2.22045E-16	.05	99	33.673
.05	.1	88	29.932
.1	.15	40	13.605
.15	.2	22	7.483
.2	.25	8	2.721
.25	.3	12	4.082
.3	.35	7	2.381
.35	.4	3	1.02
.4	.45	1	.34
.45	.5	0	0
.5	.55	3	1.02
.55	.6	2	.68
.6	.65	2	.68
.65	.7	2	.68
.7	.75	0	0
.75	.8	1	.34
.8	.85	0	0
.85	.9	0	0
.9	.95	0	0
.95	1.	0	0
1.	1.05	1	.34
1.05	1.1	0	0
1.1	1.15	1	.34
1.15	1.2	0	0
1.2	1.25	0	0
1.25	1.3	0	0
1.3	1.35	0	0
1.35	1.4	0	0
1.4	1.45	0	0
1.45	1.5	0	0
1.5	1.55	0	0
1.55	1.6	0	0
1.6	1.65	0	0
1.65	1.7	0	0
1.7	1.75	0	0
1.75	1.8	0	0
1.8	1.85	1	.34
1.85	1.9	0	0
1.9	1.95	0	0
1.95	2.	0	0
2.	0	1	.34
0	2.1	0	0
2.1	0	0	0

DO YOU WISH TO SPECIFY ANOTHER CLASS INTERVAL ? yes
PLEASE SPECIFY LOWER AND UPPER LIMITS FOR ANY TYPICAL CLASS INTERVAL, I.E., FOR A TEN UNIT INTERVAL FROM 100 TO 110, INPUT '100,110'.
? .0,.1

C U M U L A T I V E   D I S T R I B U T I O N

VALUE	NUMBER LESS THAN VALUE	PERCENT LESS THAN VALUE	VARIATE SUM - PCT LESS THAN VALUE
-.1	0	0	0
4.44089E-16	0	0	0
.1	187	63.605	19.942
.2	249	84.694	43.412
.3	269	91.497	56.904
.4	279	94.898	66.258
.5	280	95.238	67.347
.6	285	96.939	74.515
.7	289	98.299	81.498
.8	290	98.639	83.641
.9	290	98.639	83.641
1.	290	98.639	83.641
1.1	291	98.98	86.445
1.2	292	99.32	89.519
1.3	292	99.32	89.519
1.4	292	99.32	89.519
1.5	292	99.32	89.519
1.6	292	99.32	89.519
1.7	292	99.32	89.519
1.8	292	99.32	89.519
1.9	293	99.66	94.473
2.	293	99.66	94.473
1.05	294	100	100
2.2	0	98.98	0

DO YOU WISH TO SPECIFY ANOTHER CLASS INTERVAL ? no

? .0,.05

C U M U L A T I V E   D I S T R I B U T I O N

VALUE	NUMBER LESS THAN VALUE	PERCENT LESS THAN VALUE	VARIATE SUM - PCT LESS THAN VALUE
-.05	0	0	0
2.22045E-16	0	0	0
.05	99	33.673	3.008
.1	187	63.605	19.942
.15	227	77.211	32.979
.2	249	84.694	43.412
.25	257	87.415	48.149
.3	269	91.497	56.904
.35	276	93.878	63.076
.4	279	94.898	66.258
.45	280	95.238	67.347
.5	280	95.238	67.347
.55	283	96.259	71.504
.6	285	96.939	74.515
.65	287	97.619	77.937
.7	289	98.299	81.498
.75	289	98.299	81.498
.8	290	98.639	83.641
.85	290	98.639	83.641
.9	290	98.639	83.641
.95	290	98.639	83.641
1.	290	98.639	83.641
1.05	291	98.98	86.445
1.1	291	98.98	86.445
1.15	292	99.32	89.519
1.2	292	99.32	89.519
1.25	292	99.32	89.519
1.3	292	99.32	89.519
1.35	292	99.32	89.519
1.4	292	99.32	89.519
1.45	292	99.32	89.519
1.5	292	99.32	89.519
1.55	292	99.32	89.519
1.6	292	99.32	89.519
1.65	292	99.32	89.519
1.7	292	99.32	89.519
1.75	292	99.32	89.519
1.8	292	99.32	89.519
1.85	293	99.66	94.473
1.9	293	99.66	94.473
1.95	293	99.66	94.473
2.	293	99.66	94.473
0	294	100	100
2.1	0	0	0

ORDERED ARRAY

0	[illegible]	.07	.128
0	[illegible]	.074	.128
0	[illegible]	.074	.131
0	[illegible]	.075	.131
0	[illegible]	.075	.131
0	[illegible]	.075	.144
0	[illegible]	.075	.152
0	[illegible]	.076	[illegible]
0	[illegible]	.078	.158
0	.029	.079	.159
0	.031	.079	.16
0	.035	.079	.163
0	.037	.081	.163
0	.037	.081	.163
0	.037	.082	.163
0	.039	.082	.169
0	.04	.082	.169
0	.043	.082	.169
0	.044	.082	.179
0	.044	.082	.188
0	.044	.082	.188
0	.044	.082	.188
0	.044	.085	.188
0	.045	.086	.188
0	.045	.086	.189
0	.051	.086	.192
0	.051	.086	.194
0	.051	.086	.198
0	.051	.086	.205
0	.051	.086	.209
0	.053	.086	.219
0	.054	.086	.219
0	.054	.086	.219
0	.054	.095	.219
0	.054	.095	.219
0	.054	.095	.231
0	.057	.095	.25
0	.057	.097	.25
0	.058	.097	.255
0	.058	.1	.255
0	.059	.106	.255
0	.059	.11	.275
.001	.064	.11	.275
.001	.064	.11	.275
.001	.064	.11	.275
.002	.064	.11	.278
.002	.064	.113	.278
.002	.064	.113	.295
.002	.064	.113	.3
.002	.064	.113	.3
.002	.064	.113	.304
.002	.064	.116	.327
.004	.064	.116	.342
.005	.064	.117	.347
.005	.064	.118	.347
.007	.064	.118	.384
.007	.064	.12	.39
.007	.064	.12	.395
.008	.064	.12	.4
.008	.064	.12	.509
.012	.064	.12	.509
.012	.064	.12	.509
.012	.064	.12	.553
[illegible]	.064	.12	.553
[illegible]	.064	.12	.619
[illegible]	.064	.121	.638
[illegible]	.064	.124	.654
[illegible]	.064	.126	.654
[illegible]	.064	.127	.787
[illegible]	.064	.128	[illegible]
[illegible]	.064	.128	[illegible]
[illegible]	.064	.128	[illegible]
[illegible]	.064	.128	[illegible]
[illegible]	.064		

APPENDIX H. QUESTIONNAIRE COMMENTS.

Comments from the subject matter experts were solicited on the last page of the questionnaire. Following the listing of the comments (provided below) is a short discussion of the impact of those comments.

- Questionnaire is slighted toward embedded training because it is described as the panacea for all training problems and most significantly, embedded training puts troops on the actual equipment.

- The questionnaire is subjective. A Collective Front End Analysis would allow one to weigh and evaluate the capabilities of the different training alternatives based on the training alternative's ability to train the specific task.

- Need to include the training alternative - actual equipment.

- The tasks selected in this questionnaire tend to be best taught on the tank. Given embedded training is on tank training, by default these tasks are best taught on the tank. Also, most tasks do not require OPTEMPO (operating tempo - fuel) or ammunition to train; therefore, whether embedded or not, the task is best trained on the tank.

- The definitions for the criteria were not clear. The questionnaire could have been reduced with no loss of

information; the total time to complete the project was 1 3/4 hours.

- Too long. Suggest survey of 2 or 3 tasks and have several survey editions.

- Limit the number of criteria per survey - it places a greater burden on you but responses have more credibility and validity.

- Rating scale on each page is needed.

- Problem: I worked on the package at different times during the day, over a period of 3 - 4 days. The problem I have is being consistent with ratings from the previous rating periods. That is why I recommend shorter survey packets.

- Somewhere, you need to specify initial versus sustainment training . It is very difficult to make decisions about any of these criteria.

- Criteria are not mutually exclusive and choosing between them in many cases is not meaningful. For example, time and its quality will determine most everything whether it is CAI, Full Function, ET, or classroom.

- The criteria appear to be split in 2 camps. The first comes from the basic 5 (e.g. presentation, practice, feedback, evaluate, record). The 2nd group come also from the basic training milieu but they fall into a different

class of criteria. I would suggest a split between the two.

- If this format is to be used in the future you could spare the reader by just posing the generic question for each group and present a listing of forced choices.

Question ___________________________________-.

Classroom	_____	CAI	________
Classroom	_____	Full	________
Classroom	_____	ET	________

- Types of tasks (collective, crew, individual) would also be useful in determining the type of learning.

- Instructions ambiguous at first. Recommend more than one example then review the criterion and comparison table prior to beginning the survey.

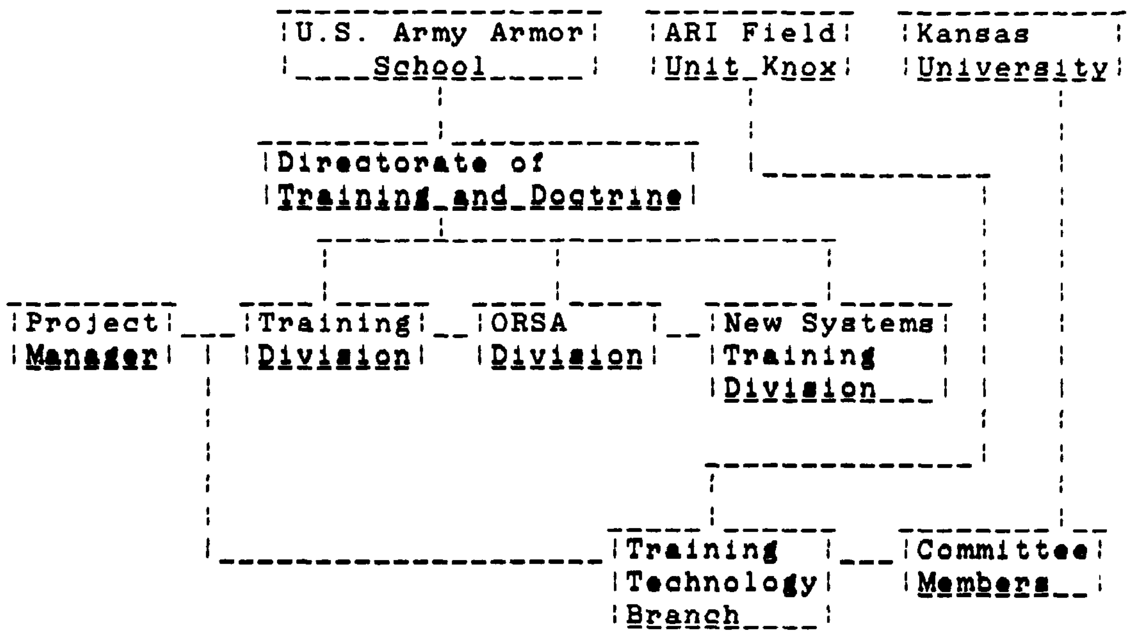
The comments concerning initial versus sustainment training, the length of the survey, and consistency of responses over several days are discussed in the recommendations section. Four comments were directed toward the criteria. It is important that the criteria be understood so that the pairwise comparisons reflect judgments that do not overlap two or more criteria. The distinction between the criteria can be emphasized during briefings held with the subject matter experts (see Chapter IX for a discussion of these briefings). While the criteria may fall into two classes the distinction in

this method is not important since what we are trying to emphasize is the criterion's ability to describe training effectiveness. The comment about limiting the number of the criteria is probably an indication that the questionnaire should be shortened. Saaty has established that the number of criteria should not exceed nine. SMEs will understand the type of task they are evaluating. A specific indication will not effect the application of the method. If the questionnaire is slanted toward embedded training it is caused by the positive impression held by the subject matter expert not because the design of the questionnaire or wording of the questions are faulted. The actual equipment is not a training alternative since the equipment by itself does not train. It is a medium used by an instructor or embedded training. The tasks used in the demonstration were selected without regard to the training medium. However, since embedded training uses the tank and an embedded training screening process was used to identify the tasks it is not inconsistent or detrimental to the method that the tasks might be suited to training on the tank.

APPENDIX I. PROJECT MANAGEMENT

ORGANIZATION:

The project was organized as shown below:



I performed the role of the project manager. Project coordination occurred with three major agencies: the U.S. Army Armor School, the U.S. Army Research Institute (ARI) Field Unit at Fort Knox, and Kansas University. Actual data and technical input to the project came from five Sub-agencies. First the task analysis used to produce the task list for the Future Armored Combat System was obtained from the Training Division. Training device strategy and training effectiveness analysis expertise was provided by the Operations Research and Systems Analysis Division. Training device technical expertise was

provided by the Systems Training Devices Branch of the New Systems Training Division. Additional information on training technology was provided by the Training Technology Branch of the ARI Field Unit at Fort Knox, Kentucky. Training, operations research, and overall project guidance was provided by the project committee members.

The original project milestones are provided below:

Research	-	Jan 1987 - Dec 1988
Method Development	-	January - February 1989
Proposal Presentation	-	29 March 1989
Collect Data	-	3 - 14 April 1989
Project Defense	-	3 - 10 May 1989

Data collection actually extended into early May and the final defense was in late May. This delay was caused by the later than expected return of some questionnaires and by the lenghty data reduction required to obtain rankings.

LESSONS LEARNED:

Several lessons were learned from this effort. First, the matrix style organization was effective in that all agencies cooperated and eventually produced both data input and comments. Collection of data would have been more effective had a functional organization been possible since direct authority could have been exerted over the subject matter experts. I was fortunate in that my past

association with the subject matter experts at the Armor School provided a spirit of cooperation that an outsider might not have been able to develop over the short data collection period. It is likely that a matrix organization would be used in the actual service school setting since the study analysts would have to interface with several school directorates to obtain the periodic expertise and time from their subject matter experts.

Another lesson learned was that the data computation (manipulation) phase took three times longer than anticipated. This put tremendous pressure on the subsequent preparation of the final report and defense presentation. Data collection should have been completed by March to allow a month and a half for data manipulation and the preparation of the final report. The data problem will be even more significant to a service school agency using the training effectiveness comparison method since so many tasks are involved.

Training studies are frequently accomplished by one analyst over an extended period of time. A study of a major new system should be conducted by a study team. This would facilitate overall management direction and timeliness of the effort. It would assist with the data manipulation problem since data reduction could be accomplished by one analyst while another continues the

collection process. It also provides workload scheduling flexibility as the lead analyst may be required to perform other tasks during several periods of a several month preliminary training effectiveness analysis.

Finally some slack time must be provided in the study project schedule. Key times are the data collection and data reduction phases of the project. This slack time will mitigate delaying effects of three problem areas. First, subject matter experts often become nonavailable due to unexpected commitments to their functional department. Second, subject matter experts whose data produces an exceptionally high consistency index will have to recompute their pairwise comparisons. Third, changing workload priorities within the analyst team's office often reduce the time available for data reduction.